

that due to the total signal power of *same cell users only*, for down- and up-links respectively. Note that here, the loss in effective interference is some 0.5 dB better for the non-optimal L-Band cell size, largely compensating for the 0.6 dB greater average off-center loss of gain, line 23.

26-29. CONFIGURATION NUMBERS. These numbers define the configuration. There are physically 12 (line 26) backhaul beams from each satellite although in the normal mode of operation, dividing CONUS into two halves, only six of these will normally be powered from each satellite. Each backhaul beam carries a ten-fold (line 12) frequency-division multiplex of CD groups, that is CD groups per Beam. Each CD group services one cell, corresponding to one beam per satellite on the mobile up and down links and to an independent satellite transmitter. Each CD group, in turn, consists of 485 (line 29) separate FDM/CDM multiplexed, 5-kbps voice circuits, or equivalent 2.4 Mbps composite rate. Each CD group is served by a separate transmit power amplifier, except for the mobile uplink, where each circuit is a separate user transmitter. Total US circuits (54,295) is given by the product of (# CIRCUITS/ BEAM) \* (# BEAMS/ US). The backhaul network provides additional capacity over the corresponding mobile links. This extra capacity is used in satellite TT&C, Network coordination, RDSS coordination, and special priority emergency services.

30. RF POWER PER Tx. From this point on the calculation is per transmitter, which represents a CD group of 485 equivalent circuits except for the mobile uplink, where it is the power of an individual user handset. Note that this is average power. All links provide at least 10-12 dB headroom for occasional upward ALC control in response to rare short term fades.

34. EIRP per CD Group. For the mobile uplink only, the CD group is comprised of the signals from various (485) user transmitters per cell. Therefore this includes the factor of number of transmitters per CD Group, line 29, 485 (26.8 dB) for the mobile uplink, otherwise 1.

35. PATH LOSS. Basic propagation loss between ideal isotropes computed for a distance of 37,000 km, corresponding to mid-CONUS.

36. RX FLUX DENSITY per 4 Khz. Computed at the mid-conus receiver, 37,000 km distance. This is for the CD Group, 485 circuits/ cell.

38. RECEIVE ANTENNA GAIN. For the uplink this is the satellite antenna average gain in line 24.

39. RECEIVED POWER PER CD GROUP. The decibel sum of lines 34, 35, 37, and 38. This is the available signal power for the 480 circuits comprising a CD group or cell.

40. NoFade SIGNAL POWER/ CKT. For the uplinks this is [Line 39] -10 log(485). For the down links, it is the received power on the preceding line times the power fraction, S1/P on the corresponding feeder uplink, and computed on line 56 of the corresponding preceding column. Beyond this point in the analysis, all signals other than the single signal of interest are regarded as and accounted for as CD self noise interference. NoFade means subject to fading not yet taken into account.

The following several NoFade Noise or Interference terms show how these various terms are taken into account in the analysis.

42. SAME CELL. This is the total signal power code-division signal power from all other users of the same CD Group, the CD Self Noise, that is 484/485 of the total CD Group signal power, [line 39]. This is incurred just once, on the uplinks only, then is transponded through the satellite to the ultimate ground receiver appearing finally on line 44 in the corresponding downlink.

43. OTHER CELLS, SIDELOBES. This is the additional CD noise power caused by the sidelobe spillover from adjacent cells and occurs only on the mobile links.

The backhaul links are sufficiently separated that beam spillover is negligible.

44. TRANSPONDED (NOISE + INTERFERENCE) POWER. For the downlinks only, this is the transponded total noise plus CD interference power, given by the total CD group power, line 39, plus (dB) the noise/power ratio given on line 57 of the corresponding uplink, in the preceding column.

45. TOTAL NoFade PATH N+I. The power sum of lines 42-44. Path noise here refers to noise and interference arriving from the satellite along with the desired single user signal, and assumed fading together with the signal.

46. UNCOMPENSATED FADING ALLOWANCE. This is the estimated residual fading at the receiver that is not compensated for by the inherent path loss sensing, transmitter ALC control circuit. This is expected to be significant only in the case of the mobile down link where the fading may be fast and the correction loop transit lag is about 1/2 second. The value here is the

estimated depth of the uncompensated residual fade at an exceedance probability corresponding to the Grade-of Service objective of 99%.

47. FadeMin NOISE, Nf. This is the Total Path Noise, [line 45] -[line 46] at fade minimum.

48. RECEIVED SIGNAL POWER AT FadeMin/ckt, S1. [line 40] - [line 46].

52. LOCAL RECEIVER AND ANTENNA NOISE, Nl. (Non-Path, i.e. not subject to correlated fading with signal). This is the total noise in the equivalent total Bandspread.

53. FadeMin TOTAL NOISE, Nt. The power sum of Nf at fade min, and Nl, local noise. This is the total noise at fade minimum. (Worst case)

54. Rx SYSTEM G/T. This is the peak value, on beam center.

55. FadeMin TOTAL P=(S1+N+I) at FadeMin. The power sum of [line 48] + [line 53].

56,57. S1/P, Nt/P. For the uplinks, these are the single signal/pwr and (Noise + Interference)/pwr split ratios for the corresponding satellite downlink transmitter. Used in lines 40 and 44 of the downlinks.

58. Voice duty cycle. (0.35). Between utterances the power for each circuit is unmodulated and cut back at the source by about 10 dB, enough to result in significant overall power saving by this ratio. The -10 dB signal is sufficient to maintain code chip tracking loop lock indefinitely.

59. Eb. The "On" period, or peak signal energy per data bit, calculated as FadeMin signal power/ckt [line 48] - $10\log(5000 * 0.35)$ .

60. No at FadeMin. Noise Power Spectral Density, [line 53] -  $10\log(\text{SPREAD BW})$ .

61. Eb/No at FadeMin.

62. Eb/Nt reqd, for  $10^{-5}$  BER. The 4.5-dB value is based on the assumed use of convolutional coding and soft decision rate-1/3 Viterbi decoding with constraint length of 7, and corresponds to a decoded bit error rate of 1 in  $10^{-5}$ .

63. M, modem implementation loss, 0.5 dB is typical

64. Excess margin at Fade Minimum. It is believed that all significant sources of power budget uncertainty have been allowed for in this budget so the system requirement is met if these numbers are greater than zero. In the analysis, this quantity is driven to zero by choice of number of circuits per cell in line 11. Thus the number of circuits per cell is determined implicitly by this condition. The result in Table E-2, mode 1 is a fully loaded maximum capacity of 54,295 total CONUS 5-kbp/s voice circuits at zero excess link margin.

Table E-2 is for the hybrid configuration in which two of the 1.25-MHz subbands are allocated to ground cell service leaving only 12 for the satellite service. It is anticipated that no more than approximately 50% of the 112 US satellite cells will warrant the inclusion of a ground cellular hybrid component. In the other 50%, all 14 1.25-MHz subbands are available to the satellite service. This "all satellite" case is given in Table E-10/12 modes 9 and 11. Note that the full US capacity in this case is increased from 54,295 to 56,789. To put it the other way around, the use of 2/14 or 14% of the available space-cell bandwidth for the ground hybrid element results in a loss of only 4.6% of potential capacity of the corresponding space-cell component. The representation of the satellite system capacity is thus conservative, corresponding to the worst case, of all hybrid operation. If, for example, only half the cells are operated in this mode, the total US capacity is the average of the two numbers above, or 55,542.

In the link budgets it was assumed for illustration that the number of circuits per cell is uniform over all cells. This is not a constraint, however. To a large extent it is possible to trade capacity and associated prime power between cells as long as the total circuit loading per satellite is (essentially) constant. This means, for example, that if the circuit loading of one rural area is light, e.g. say just half, or 240 circuits, then additional

circuits (almost but not quite the other 240 may be made available for another more heavily loaded cell. This also means that advantage can be taken of peak-hour staggering between east and west coasts to gain additional virtual circuit capacity. The costs of such cell "bonus" capacity consist of:

- slight loss of total capacity;
- requirement for additional circuit termination modules at the hub;
- proportionally increased total flux density in the bonus cell; and
- proportionally increased satellite power amp headroom design requirement.

This tradeoff capability also means that if particularly sensitive interference problems should arise in one cell, some accommodation can be provided by reducing cell circuit capacity with corresponding reduction of total cell flux density.

#### **GROUND CELL POWER BUDGET**

Table E-17 presents the nominal ground cell element power budget for the forward (Node-to-Mobile) and Return (Mobile-to-Node) links. Explanation of terms largely follows that of the satellite-mobile links. Nominal average fixed site power is 20 W and mobile power 0.1 W, resulting in excellent battery life.

In the regions where it is employed, the nominal ground cell element operates in two 1.25-MHz subbands, a total of 2.5 MHz of the allocation. It is estimated that approximately 50% of the satellite cells will be so divided. This allocation is flexible and dynamic. The nominal capacity is 118 circuits per cell for 2.5 MHz bandwidth. The nominal ground cell area is 616 sq-km, as compared to 105,000 sq-km for a mid-CONUS satellite cell. In other words there is a potential for as many as 170 ground cells per satellite cell. Of course it would not normally be economically feasible to implement other than a fraction of such cells.

\* \* \* \* \*

CONFIGURATION CAPACITY SUMMARY

01/17/92 14:37:53

NUMBER OF US SATELLITE CIRCUITS

|                          | PRIMARY FREQS |               | ALTERNATE FREQS |         |
|--------------------------|---------------|---------------|-----------------|---------|
|                          | 2110/2410 MHz | 2483/1610 MHz | TWO SAT         | ONE SAT |
| HYBRID # SUBBANDS:       | 12            | 12            | 10              | 10      |
| PRIME PWR LIMITED        | 54295         | 34740         | 57868           | 36438   |
| FLUX DENS LIMITED (-144) | 26967         | 26967         | 23430           | 23430   |
| SAT ONLY # SUBBANDS:     | 14            | 14            | 12              | 12      |
| PRIME PWR LIMITED        | 56789         | 354185        | 60905           | 37332   |
| FLUX DENS LIMITED (-144) | 30852         | 30852         | 27560           | 27560   |

TABLE E-1

TABLE 1. SATELLITE LINK POWER BUDGET  
PRIME POWER LIMITED

TWO SATELLITE CASE  
PRIMARY FREQUENCY REQUEST

1 MODE

| MSAT POWER BUDGET | 10                           | 01/17/92 | 14:17  | PER SATELLITE EXCEPT AS NOTED |           |                |
|-------------------|------------------------------|----------|--------|-------------------------------|-----------|----------------|
| 7                 | DC PWR TO S-BAND DOWNLINK    | 2300     | W      | SPRD BW                       | 15.00     | MH (Sat Total) |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.   | 0.35     |        | BKHL BW                       | 150.0     | MHz            |
| 9                 | SAT-MOBL RF PWR, TOTAL       | 805.0    | W      | FAST FADE                     | 4.0       | dB (One Way)   |
| 10                | #US CELLS (inc AK, HI, PR/V) | 112      |        | DATA RATE                     | 5000      | bps/ckt        |
| 11                | # VOICE CKTS PER CELL (CD GR | 485      |        | # SATS.                       | 2         |                |
| 12                | # CD GRP/CLUSTER (BKHL MPX)  | 10       |        | # US CKTS                     | 54295     |                |
| 13                | # CLUSTER PER CONUS          | 12       |        | FOR'D MAR                     | 0.0       | dB             |
| 14                | # 1.25 SUBBANDS/GRP          | 12       | 10.0   | RET MARG                      | 3.2       | dB             |
| 15                |                              | HUB      | > SAT  | > MOB                         | ILE > SAT | > HUB          |
| 16                |                              | UP       | DOWN   | UP                            | DOWN      |                |
| 17                | FREQUENCY                    | 29900.0  | 2110.0 | 2410.0                        | 20100.0   | MHz            |
| 18                | SAT REFLECTOR, DIA.          | 1.5      | 20.0   | 20.0                          | 2.0       | m              |
| 19                | ILLUM. FACTOR                | 0.49     | 0.49   | 0.49                          | 0.49      |                |
| 20                | 3dB BMW                      | 0.43     | 0.51   | 0.44                          | 0.46      | deg            |
| 21                | CELL MAJOR DIAM              |          | 0.51   | 0.51                          |           | deg            |
| 22                | MAJOR DIAM XOVER PT          |          | 3.0    | 3.9                           |           | dB             |
| 23                | AVG OFF CTR. LOSS            | 0.2      | 2.0    | 2.6                           | 0.2       | dB             |
| 24                | AVG IN-CELL GAIN             | 50.1     | 47.8   | 48.4                          | 49.2      | dB             |
| 25                | TOTAL BEAM INTERF FACTOR     | 0.0      | 2.4    | 1.9                           | 0.0       | PwrFactor      |
| 26                | # US BEAMS/ SAT              | 6        | 112    | 112                           | 6         |                |
| 27                | # CD GRP/BEAM                | 10       | 1      | 1                             | 10        |                |
| 28                | # Tx/ CD GRP/ SAT            | 1        | 1      | 485                           | 1         |                |
| 29                | # CIRCUITS/ BEAM             | 4848     | 485    | 1                             | 4848      | CIRCUITS       |
| 30                | RF PWR/ Tx                   | 0.5      | 14.4   | 0.1                           | 0.1       | W              |
| 31                | CIRCUIT LOSS                 | -2.7     | -0.8   | -1.0                          | -1.0      | dB             |
| 32                | ANT RF POWER/ Tx             | -5.7     | 10.8   | -11.0                         | -11.0     | dBW            |
| 33                | TRANSMIT ANT GAIN            | 50.1     | 47.8   | 2.0                           | 49.2      | dB             |
| 34                | EIRP / CDGrp                 | 44.4     | 58.6   | 17.9                          | 38.2      | dBW            |
| 35                | FREE SPACE PATH LOSS, Lb     | -213.3   | -190.3 | -191.5                        | -209.9    | dB             |
| 36                | Rx FLUX DENS/4kHz            | -153.7   | -139.5 | -180.3                        | -159.9    | dBW/m^2/4KHz   |
| 37                | POLARIZATION LOSS            | -0.5     | -0.5   | -0.5                          | -0.5      | dB             |
| 38                | RECEIVE ANT GAIN             | 50.1     | 2.0    | 48.4                          | 49.2      | dB             |
| 39                | RCVD PWR / CDGrp             | -119.3   | -130.2 | -125.8                        | -123.0    | dBW            |
| 40                | NoFade SIG PWR/ Ckt          | -146.1   | -157.6 | -152.6                        | -153.8    | dBW            |
| 41                | NoFade N+I Terms:            |          |        |                               |           |                |
| 42                | SAME CELL                    | -119.3   |        | -125.8                        |           | dBW            |
| 43                | OTHER CELL SIDELOBES         |          | -128.7 | -126.0                        |           | dBW            |
| 44                | XPOND'D N+I                  |          | -130.2 |                               | -123.0    | dBW            |
| 45                | TOTAL NoFade PATH N+I        | -119.3   | -126.4 | -122.9                        | -123.0    | dBW            |
| 46                | UNCOMP. FADE ALLOWANCE       | 0.0      | 4.0    | 1.0                           | 0.0       | dB             |
| 47                | FadeMin NOISE , Nf           | -119.3   | -130.4 | -123.9                        | -123.0    | dBW            |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1 | -146.1   | -161.6 | -153.6                        | -153.8    | dBW            |
| 49                | RCVR NOISE FIGURE            | 4.2      | 3.1    | 2.6                           | 4.2       | dB             |
| 50                | RCVR NOISE (Non-Fade)        | 479.8    | 302.1  | 237.7                         | 479.8     | deg K          |
| 51                | ANTENNA NOISE (Non-Fade)     | 290.0    | 270.0  | 290.0                         | 80.0      | deg K          |
| 52                | LOCAL NOISE, NI, in Bspread  | -128.0   | -129.3 | -129.6                        | -129.4    | dBW            |
| 53                | FadeMin TOT NOISE, Nt=Nf+NI  | -118.7   | -126.8 | -122.8                        | -122.1    | dBW            |
| 54                | Rx SYSTEM G/T, pk on ctr     | 21.3     | -25.6  | 23.7                          | 21.7      |                |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt | -118.7   | -126.8 | -122.8                        | -122.1    | dBW            |
| 56                | S1/P = Signal/Pwr Fraction   | -27.4    |        | -30.8                         |           | dB             |
| 57                | Nt/P = Noise/Pwr Fraction    | -0.0     |        | -0.0                          |           | dB             |
| 58                | VOICE DUTY CYCLE             |          | 0.35   |                               | 0.35      | -              |
| 59                | Eb (FadeMin, Avg On pk)      |          | -194.1 |                               | -186.2    | dBW/Hz         |
| 60                | No, N+I PSD, FadeMin         |          | -198.6 |                               | -193.9    | dBW/Hz         |
| 61                | Eb/No, fade min              |          | 4.5    |                               | 7.7       | dB             |
| 62                | Eb/Nt, req'd                 |          | 4.0    |                               | 4.0       | dB             |
| 63                | MODEM IMP LOSS, M            |          | 0.5    |                               | 0.5       | dB             |
| 64                | EXCESS MARGIN at fade min    |          | 0.0    |                               | 3.2       | dB             |

TABLE E-2

TABLE 1. SATELLITE LINK POWER BUDGET  
PRIME POWER LIMITED

| MSAT POWER BUDGET |                               | 10      | 01/17/92        | 14:20           | ONE SATELLITE CASE            |                 | 2 MODE            |
|-------------------|-------------------------------|---------|-----------------|-----------------|-------------------------------|-----------------|-------------------|
|                   |                               |         |                 |                 | PRIMARY FREQUENCY REQUEST     |                 |                   |
|                   |                               |         |                 |                 | PER SATELLITE EXCEPT AS NOTED |                 |                   |
| 7                 | DC PWR TO S-BAND DOWNLNK      | 2300    | W               | SPRD BW         | 15.00                         | MHz (Sat Total) | 12 *1.25 MHz      |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35    |                 | BKHL BW         | 150.0                         | MHz             |                   |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 805.0   | W               | FAST FADE       | 4.0                           | dB (One Way)    |                   |
| 10                | #US CELLS (inc AK, HI, PR/VI) | 112     |                 | DATA RATE       | 5000                          | bps/ckt         |                   |
| 11                | # VOICE CKTS PER CELL (CD GR  | 310     |                 | # SATS.         | 1                             |                 |                   |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10      |                 | # US CKTS       | 34740                         |                 |                   |
| 13                | # CLUSTER PER CONUS           | 12      |                 | FOR'D MAR       | 0.0                           | dB              | 0.000 dB          |
| 14                | # 1.25 SUBBANDS/GRP           | 12      | 10.0            | RET MARG        | 4.6                           | dB              | 4.621 dB          |
| 15                |                               |         | HUB > SAT > MOB | ILE > SAT > HUB |                               |                 |                   |
| 16                |                               |         | UP              | DOWN            | UP                            | DOWN            |                   |
| 17                | FREQUENCY                     | 29900.0 | 2110.0          | 2410.0          | 20100.0                       | MHz             | 1 FREQ ALTERNATE  |
| 18                | SAT REFLECTOR, DIA.           | 1.5     | 20.0            | 20.0            | 2.0                           | m               |                   |
| 19                | ILLUM. FACTOR                 | 0.49    | 0.49            | 0.49            | 0.49                          |                 | CELL MAJ DIAM     |
| 20                | 3dB BMW                       | 0.43    | 0.51            | 0.44            | 0.46                          | deg             | 204 sm (E-W)      |
| 21                | CELL MAJOR DIAM               |         | 0.51            | 0.51            |                               | deg             |                   |
| 22                | MAJOR DIAM XOVER PT           |         | 3.0             | 3.9             |                               | dB              |                   |
| 23                | Avg OFF CTR. LOSS             | 0.2     | 2.0             | 2.6             | 0.2                           | dB              |                   |
| 24                | Avg IN-CELL GAIN              | 50.1    | 47.8            | 48.4            | 49.2                          | dB              | TOTAL US CKTS     |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0     | 2.4             | 1.9             | 0.0                           | PwrFactor       | 34740             |
| 26                | # US BEAMS/ SAT               | 12      | 112             | 112             | 12                            |                 | TOTAL CONUS CKTS  |
| 27                | # CD GRP/BEAM                 | 10      | 1               | 1               | 10                            |                 | 33809 FOR         |
| 28                | # Tx/ CD GRP/ SAT             | 1       | 1               | 310             | 1                             |                 | 1 SATELLITE(S)    |
| 29                | # CIRCUITS/ BEAM              | 3102    | 310             | 1               | 3102                          | CIRCUITS        |                   |
| 30                | RF PWR/ Tx                    | 0.5     | 7.2             | 0.1             | 0.1                           | W               | K-BAND POWER/ SAT |
| 31                | CIRCUIT LOSS                  | -2.7    | -0.8            | -1.0            | -1.0                          | dB              | 12.0 W RF         |
| 32                | ANT RF POWER/ Tx              | -5.7    | 7.8             | -11.0           | -11.0                         | dBW             | 34.3 W DC         |
| 33                | TRANSMIT ANT GAIN             | 50.1    | 47.8            | 2.0             | 49.2                          | dB              | TOTAL PWR/ SAT    |
| 34                | EIRP / CDGrp                  | 44.4    | 55.6            | 15.9            | 38.2                          | dBW             | 817 W RF          |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3  | -190.3          | -191.5          | -209.9                        | dB              |                   |
| 36                | Rx FLUX DENS/4kHz             | -153.7  | -142.5          | -182.2          | -159.9                        | dBW/m^2/4KHz    |                   |
| 37                | POLARIZATION LOSS             | -0.5    | -0.5            | -0.5            | -0.5                          | dB              |                   |
| 38                | RECEIVE ANT GAIN              | 50.1    | 2.0             | 48.4            | 49.2                          | dB              |                   |
| 39                | RCVD PWR / CDGrp              | -119.3  | -133.2          | -127.7          | -123.0                        | dBW             |                   |
| 40                | NoFade SIG PWR/ Ckt           | -144.2  | -158.7          | -152.6          | -152.3                        | dBW             |                   |
| 41                | NoFade N+I Terms:             |         |                 |                 |                               |                 |                   |
| 42                | SAME CELL                     | -119.3  |                 | -127.7          |                               | dBW             |                   |
| 43                | OTHER CELL SIDELOBES          |         | -131.7          | -127.9          |                               | dBW             |                   |
| 44                | XPOND'D N+I                   |         | -133.2          |                 | -123.0                        | dBW             |                   |
| 45                | TOTAL NoFade PATH N+I         | -119.3  | -129.4          | -124.8          | -123.0                        | dBW             |                   |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0     | 4.0             | 1.0             | 0.0                           | dB              |                   |
| 47                | FadeMin NOISE , Nf            | -119.3  | -133.4          | -125.8          | -123.0                        | dBW             |                   |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -144.2  | -162.7          | -153.6          | -152.3                        | dBW             |                   |
| 49                | RCVR NOISE FIGURE             | 4.2     | 3.1             | 2.6             | 4.2                           | dB              |                   |
| 50                | RCVR NOISE (Non-Fade)         | 479.8   | 302.1           | 237.7           | 479.8                         | deg K           |                   |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0   | 270.0           | 290.0           | 80.0                          | deg K           |                   |
| 52                | LOCAL NOISE, NI, in Bspread   | -128.0  | -129.3          | -129.6          | -129.4                        | dBW             |                   |
| 53                | FadeMin TOT NOISE, Nt=Nf+NI   | -118.7  | -127.9          | -124.3          | -122.1                        | dBW             |                   |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3    | -25.6           | 23.7            | 21.7                          |                 |                   |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.7  | -127.9          | -124.3          | -122.1                        | dBW             |                   |
| 56                | S1/P = Signal/Pwr Fraction    | -25.5   |                 | -29.3           |                               | dB              |                   |
| 57                | Nt/P = Noise/Pwr Fraction     | -0.0    |                 | -0.0            |                               | dB              |                   |
| 58                | VOICE DUTY CYCLE              |         | 0.35            |                 | 0.35                          | -               |                   |
| 59                | Eb (FadeMin, Avg On pk)       |         | -195.1          |                 | -184.8                        | dBW/Hz          |                   |
| 60                | No, N+I PSD, FadeMin          |         | -199.6          |                 | -193.9                        | dBW/Hz          |                   |
| 61                | Eb/No, fade min               |         | 4.5             |                 | 9.1                           | dB              |                   |
| 62                | Eb/Nt, req'd                  |         | 4.0             |                 | 4.0                           | dB              |                   |
| 63                | MODEM IMP LOSS, M             |         | 0.5             |                 | 0.5                           | dB              |                   |
| 64                | EXCESS MARGIN at fade min     |         | 0.0             |                 | 4.6                           | dB              |                   |

TABLE E-3

TABLE 1. SATELLITE LINK POWER BUDGET  
PRIME POWER LIMITED

TWO SATELLITE CASE  
ALTERNAT FREQUENCY REQUEST

| MSAT POWER BUDGET | 10                            | 01/17/92        | 14:20           | PER SATELLITE EXCEPT AS NOTED |         |                |
|-------------------|-------------------------------|-----------------|-----------------|-------------------------------|---------|----------------|
| 7                 | DC PWR TO S-BAND DOWNLINK     | 2300            | W               | SPRD BW                       | 12.50   | MH (Sat Total) |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35            |                 | BKHL BW                       | 125.0   | MHz            |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 805.0           | W               | FAST FADE                     | 4.0     | dB (One Way)   |
| 10                | #US CELLS (inc AK, HI, PR/VI) | 149             |                 | DATA RATE                     | 5000    | bps/ckt        |
| 11                | # VOICE CKTS PER CELL (CD GR  | 388             |                 | # SATS.                       | 2       |                |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10              |                 | # US CKTS                     | 57868   |                |
| 13                | # CLUSTER PER CONUS           | 15              |                 | FOR'D MAR                     | 0.0     | dB             |
| 14                | # 1.25 SUBBANDS/GRP           | 10              | 10.0            | RET MARG                      | 0.7     | dB             |
| 15                |                               | HUB > SAT > MOB | ILE > SAT > HUB |                               |         |                |
| 16                |                               | UP              | DOWN            | UP                            | DOWN    |                |
| 17                | FREQUENCY                     | 29900.0         | 2483.5          | 1610.0                        | 20100.0 | MHz            |
| 18                | SAT REFLECTOR, DIA.           | 1.5             | 20.0            | 20.0                          | 2.0     | m              |
| 19                | ILLUM. FACTOR                 | 0.49            | 0.49            | 0.49                          | 0.49    |                |
| 20                | 3dB BMW                       | 0.43            | 0.43            | 0.67                          | 0.46    | deg            |
| 21                | CELL MAJOR DIAM               |                 | 0.43            | 0.43                          |         | deg            |
| 22                | MAJOR DIAM XOVER PT           |                 | 3.0             | 1.3                           |         | dB             |
| 23                | AVG OFF CTR. LOSS             | 0.2             | 2.0             | 0.8                           | 0.2     | dB             |
| 24                | AVG IN-CELL GAIN              | 50.1            | 49.2            | 46.6                          | 49.2    | dB             |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0             | 2.4             | 4.3                           | 0.0     | PwrFactor      |
| 26                | # US BEAMS/ SAT               | 8               | 149             | 149                           | 8       |                |
| 27                | # CD GRP/BEAM                 | 10              | 1               | 1                             | 10      |                |
| 28                | # Tx/ CD GRP/ SAT             | 1               | 1               | 388                           | 1       |                |
| 29                | # CIRCUITS/ BEAM              | 3884            | 388             | 1                             | 3884    | CIRCUITS       |
| 30                | RF PWR/ Tx                    | 0.5             | 10.8            | 0.1                           | 0.1     | W              |
| 31                | CIRCUIT LOSS                  | -2.7            | -0.8            | -1.0                          | -1.0    | dB             |
| 32                | ANT RF POWER/ Tx              | -5.7            | 9.5             | -11.0                         | -11.0   | dBW            |
| 33                | TRANSMIT ANT GAIN             | 50.1            | 49.2            | 2.0                           | 49.2    | dB             |
| 34                | EIRP / CDGrp                  | 44.4            | 58.8            | 16.9                          | 38.2    | dBW            |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3          | -191.7          | -188.0                        | -209.9  | dB             |
| 36                | Rx FLUX DENS/4kHz             | -152.9          | -138.6          | -180.4                        | -159.1  | dBW/m ^ 2/4KHz |
| 37                | POLARIZATION LOSS             | -0.5            | -0.5            | -0.5                          | -0.5    | dB             |
| 38                | RECEIVE ANT GAIN              | 50.1            | 2.0             | 46.6                          | 49.2    | dB             |
| 39                | RCVD PWR / CDGrp              | -119.3          | -131.5          | -124.9                        | -123.0  | dBW            |
| 40                | NoFade SIG PWR/ Ckt           | -145.2          | -157.8          | -150.8                        | -155.6  | dBW            |
| 41                | NoFade N+I Terms:             |                 |                 |                               |         |                |
| 42                | SAME CELL                     | -119.3          |                 | -125.0                        |         | dBW            |
| 43                | OTHER CELL SIDELOBES          |                 | -129.9          | -119.7                        |         | dBW            |
| 44                | XPOND'D N+I                   |                 | -131.5          |                               | -123.0  | dBW            |
| 45                | TOTAL NoFade PATH N+I         | -119.3          | -127.6          | -118.6                        | -123.0  | dBW            |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0             | 4.0             | 1.0                           | 0.0     | dB             |
| 47                | FadeMin NOISE , Nf            | -119.3          | -131.6          | -119.6                        | -123.0  | dBW            |
| 48                | FadeMin RCVD SIG PWR/Ckt. S1  | -145.2          | -161.8          | -151.8                        | -155.6  | dBW            |
| 49                | RCVR NOISE FIGURE             | 4.2             | 3.1             | 2.6                           | 4.2     | dB             |
| 50                | RCVR NOISE (Non-Fade)         | 479.8           | 302.1           | 237.7                         | 479.8   | deg K          |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0           | 270.0           | 290.0                         | 80.0    | deg K          |
| 52                | LOCAL NOISE, NI, in Bspread   | -128.8          | -130.1          | -130.4                        | -130.2  | dBW            |
| 53                | FadeMin TOT NOISE, Nt=Nf+NI   | -118.8          | -127.8          | -119.3                        | -122.3  | dBW            |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3            | -25.6           | 20.2                          | 21.7    |                |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.8          | -127.8          | -119.3                        | -122.2  | dBW            |
| 56                | S1/P = Signal/Pwr Fraction    | -26.4           |                 | -32.6                         |         | dB             |
| 57                | Nt/P = Noise/Pwr Fraction     | -0.0            |                 | -0.0                          |         | dB             |
| 58                | VOICE DUTY CYCLE              |                 | 0.35            |                               | 0.35    | -              |
| 59                | Eb (FadeMin, Avg On pk)       |                 | -194.2          |                               | -188.0  | dBW/Hz         |
| 60                | No, N+I PSD, FadeMin          |                 | -198.7          |                               | -193.2  | dBW/Hz         |
| 61                | Eb/No, fade min               |                 | 4.5             |                               | 5.2     | dB             |
| 62                | Eb/Nt, req'd                  |                 | 4.0             |                               | 4.0     | dB             |
| 63                | MODEM IMP LOSS, M             |                 | 0.5             |                               | 0.5     | dB             |
| 64                | EXCESS MARGIN at fade min     |                 | 0.0             |                               | 0.7     | dB             |

TABLE E-4

TABLE 1. SATELLITE LINK POWER BUDGET  
PRIME POWER LIMITEDONE SATELLITE CASE  
ALTERNAT FREQUENCY REQUEST

| MSAT POWER BUDGET |                               | 10      | 01/17/92        | 14:22     | PER SATELLITE EXCEPT AS NOTED |                |                   |
|-------------------|-------------------------------|---------|-----------------|-----------|-------------------------------|----------------|-------------------|
| 7                 | DC PWR TO S-BAND DOWNLINK     | 2300    | W               | SPRD BW   | 12.50                         | MH (Sat Total) | 10 *1.25 MHz      |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35    |                 | BKHL BW   | 125.0                         | MHz            |                   |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 805.0   | W               | FAST FADE | 4.0                           | dB (One Way)   |                   |
| 10                | #US CELLS (inc AK, HI, PR/VI) | 149     |                 | DATA RATE | 5000                          | bps/ckt        |                   |
| 11                | # VOICE CKTS PER CELL (CD GR  | 245     |                 | # SATS.   | 1                             |                |                   |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10      |                 | # US CKTS | 36438                         |                |                   |
| 13                | # CLUSTER PER CONUS           | 15      |                 | FORD MAR  | 0.0                           | dB             | 0.000 dB          |
| 14                | # 1.25 SUBBANDS/GRP           | 10      | 10.0            | RET MARG  | 2.5                           | dB             | 2.509 dB          |
| 15                | HUB > SAT > MOB               |         | ILE > SAT > HUB |           |                               |                |                   |
| 16                | UP                            | DOWN    | UP              | DOWN      |                               |                |                   |
| 17                | FREQUENCY                     | 29900.0 | 2483.5          | 1610.0    | 20100.0                       | MHz            | 2 FREQ ALTERNATE  |
| 18                | SAT REFLECTOR, DIA.           | 1.5     | 20.0            | 20.0      | 2.0                           | m              |                   |
| 19                | ILLUM. FACTOR                 | 0.49    | 0.49            | 0.49      | 0.49                          |                |                   |
| 20                | 3dB BMW                       | 0.43    | 0.43            | 0.67      | 0.46                          | deg            | CELL MAJ DIAM     |
| 21                | CELL MAJOR DIAM               |         |                 | 0.43      |                               | deg            | 174 sm (E-W)      |
| 22                | MAJOR DIAM XOVER PT           |         |                 | 3.0       | 1.3                           |                |                   |
| 23                | AVG OFF CTR. LOSS             | 0.2     | 2.0             | 0.8       | 0.2                           | dB             |                   |
| 24                | AVG IN-CELL GAIN              | 50.1    | 49.2            | 46.6      | 49.2                          | dB             | TOTAL US CKTS     |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0     | 2.4             | 4.3       | 0.0                           | PwrFactor      | 36438             |
| 26                | # US BEAMS/ SAT               | 15      | 149             | 149       | 15                            |                | TOTAL CONUS CKTS  |
| 27                | # CD GRP/BEAM                 | 10      | 1               | 1         | 10                            |                | 35705 FOR         |
| 28                | # Tx/ CD GRP/ SAT             | 1       | 1               | 245       | 1                             |                | 1 SATELLITE(S)    |
| 29                | # CIRCUITS/ BEAM              | 2446    | 245             | 1         | 2446                          | CIRCUITS       |                   |
| 30                | RF PWR/ Tx                    | 0.5     | 5.4             | 0.1       | 0.1                           | W              | K-BAND POWER/ SAT |
| 31                | CIRCUIT LOSS                  | -2.7    | -0.8            | -1.0      | -1.0                          | dB             | 15.0 W RF         |
| 32                | ANT RF POWER/ Tx              | -5.7    | 6.5             | -11.0     | -11.0                         | dBW            | 42.9 W DC         |
| 33                | TRANSMIT ANT GAIN             | 50.1    | 49.2            | 2.0       | 49.2                          | dB             | TOTAL PWR/ SAT    |
| 34                | EIRP / CDGrp                  | 44.4    | 55.8            | 14.9      | 38.2                          | dBW            | 820 W RF          |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3  | -191.7          | -188.0    | -209.9                        | dB             |                   |
| 36                | Rx FLUX DENS/4kHz             | -152.9  | -141.6          | -182.4    | -159.1                        | dBW/m ^ 2/4KHz |                   |
| 37                | POLARIZATION LOSS             | -0.5    | -0.5            | -0.5      | -0.5                          | dB             |                   |
| 38                | RECEIVE ANT GAIN              | 50.1    | 2.0             | 46.6      | 49.2                          | dB             |                   |
| 39                | RCVD PWR / CDGrp              | -119.3  | -134.5          | -127.0    | -123.0                        | dBW            |                   |
| 40                | NoFade SIG PWR/ Ckt           | -143.2  | -158.8          | -150.8    | -153.8                        | dBW            |                   |
| 41                | NoFade N+I Terms:             |         |                 |           |                               |                |                   |
| 42                | SAME CELL                     | -119.3  |                 | -127.0    |                               | dBW            |                   |
| 43                | OTHER CELL SIDELOBES          |         | -133.0          | -121.7    |                               | dBW            |                   |
| 44                | XPOND'D N+I                   |         | -134.5          |           | -123.0                        | dBW            |                   |
| 45                | TOTAL NoFade PATH N+I         | -119.3  | -130.6          | -120.6    | -123.0                        | dBW            |                   |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0     | 4.0             | 1.0       | 0.0                           | dB             |                   |
| 47                | FadeMin NOISE , Nf            | -119.3  | -134.6          | -121.6    | -123.0                        | dBW            |                   |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -143.2  | -162.8          | -151.8    | -153.8                        | dBW            |                   |
| 49                | RCVR NOISE FIGURE             | 4.2     | 3.1             | 2.6       | 4.2                           | dB             |                   |
| 50                | RCVR NOISE (Non-Fade)         | 479.8   | 302.1           | 237.7     | 479.8                         | deg K          |                   |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0   | 270.0           | 290.0     | 80.0                          | deg K          |                   |
| 52                | LOCAL NOISE, NI, in Bspread   | -128.8  | -130.1          | -130.4    | -130.2                        | dBW            |                   |
| 53                | FadeMin TOT NOISE, Nt=Nf+NI   | -118.8  | -128.8          | -121.1    | -122.3                        | dBW            |                   |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3    | -25.6           | 20.2      | 21.7                          |                |                   |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.8  | -128.8          | -121.1    | -122.2                        | dBW            |                   |
| 56                | S1/P = Signal/Pwr Fraction    | -24.3   |                 | -30.8     |                               | dB             |                   |
| 57                | Nt/P = Noise/Pwr Fraction     | -0.0    |                 | -0.0      |                               | dB             |                   |
| 58                | VOICE DUTY CYCLE              |         | 0.35            |           | 0.35                          | -              |                   |
| 59                | Eb (FadeMin, Avg On pk)       |         | -195.2          |           | -186.2                        | dBW/Hz         |                   |
| 60                | No, N+I PSD, FadeMin          |         | -199.7          |           | -193.2                        | dBW/Hz         |                   |
| 61                | Eb/No, fade min               |         | 4.5             |           | 7.0                           | dB             |                   |
| 62                | Eb/Nt, req'd                  |         | 4.0             |           | 4.0                           | dB             |                   |
| 63                | MODEM IMP LOSS, M             |         | 0.5             |           | 0.5                           | dB             |                   |
| 64                | EXCESS MARGIN at fade min     |         | 0.0             |           | 2.5                           | dB             |                   |

TABLE E-5

TABLE 1. SATELLITE LINK POWER BUDGET  
FLUX DENSITY LIMITED

TWO SATELLITE CASE  
PRIMARY FREQUENCY REQUEST

| MSAT POWER BUDGET 10 |                               | 01/17/92        | 14:24           | PER SATELLITE EXCEPT AS NOTED |         |                |
|----------------------|-------------------------------|-----------------|-----------------|-------------------------------|---------|----------------|
| 7                    | DC PWR TO S-BAND DOWNLINK     | 821             | W               | SPRD BW                       | 15.00   | MH (Sat Total) |
| 8                    | SAT-MOBL DOWNLINK AMP EFF.    | 0.35            |                 | BKHL BW                       | 150.0   | MHz            |
| 9                    | SAT-MOBL RF PWR, TOTAL        | 287.5           | W               | FAST FADE                     | 4.0     | dB (One Way)   |
| 10                   | #US CELLS (inc AK, HI, PR/VI) | 112             |                 | DATA RATE                     | 5000    | bps/ckt        |
| 11                   | # VOICE CKTS PER CELL (CD GR  | 241             |                 | # SATS.                       | 2       |                |
| 12                   | # CD GRP/CLUSTER (BKHL MPX)   | 10              |                 | # US CKTS                     | 26967   |                |
| 13                   | # CLUSTER PER CONUS           | 12              |                 | FOR'D MAR                     | 0.0     | dB             |
| 14                   | # 1.25 SUBBANDS/GRP           | 12              | 10.0            | RET MARG                      | 5.4     | dB             |
| 15                   |                               | HUB > SAT > MOB | ILE > SAT > HUB |                               |         |                |
| 16                   |                               | UP              | DOWN            | UP                            | DOWN    |                |
| 17                   | FREQUENCY                     | 29900.0         | 2110.0          | 2410.0                        | 20100.0 | MHz            |
| 18                   | SAT REFLECTOR, DIA.           | 1.5             | 20.0            | 20.0                          | 2.0     | m              |
| 19                   | ILLUM. FACTOR                 | 0.49            | 0.49            | 0.49                          | 0.49    |                |
| 20                   | 3dB BMW                       | 0.43            | 0.51            | 0.44                          | 0.46    | deg            |
| 21                   | CELL MAJOR DIAM               |                 | 0.51            | 0.51                          |         | deg            |
| 22                   | MAJOR DIAM XOVER PT           |                 | 3.0             | 3.9                           |         | dB             |
| 23                   | AVG OFF CTR. LOSS             | 0.2             | 2.0             | 2.6                           | 0.2     | dB             |
| 24                   | AVG IN-CELL GAIN              | 50.1            | 47.8            | 48.4                          | 49.2    | dB             |
| 25                   | TOTAL BEAM INTERF FACTOR      | 0.0             | 2.4             | 1.9                           | 0.0     | PwrFactor      |
| 26                   | # US BEAMS/ SAT               | 6               | 112             | 112                           | 6       |                |
| 27                   | # CD GRP/BEAM                 | 10              | 1               | 1                             | 10      |                |
| 28                   | # Tx/ CD GRP/ SAT             | 1               | 1               | 241                           | 1       |                |
| 29                   | # CIRCUITS/ BEAM              | 2408            | 241             | 1                             | 2408    | CIRCUITS       |
| 30                   | RF PWR/ Tx                    | 0.5             | 5.1             | 0.1                           | 0.1     | W              |
| 31                   | CIRCUIT LOSS                  | -2.7            | -0.8            | -1.0                          | -1.0    | dB             |
| 32                   | ANT RF POWER/ Tx              | -5.7            | 6.3             | -11.0                         | -11.0   | dBW            |
| 33                   | TRANSMIT ANT GAIN             | 50.1            | 47.8            | 2.0                           | 49.2    | dB             |
| 34                   | EIRP / CDGrp                  | 44.4            | 54.1            | 14.8                          | 38.2    | dBW            |
| 35                   | FREE SPACE PATH LOSS, Lb      | -213.3          | -190.3          | -191.5                        | -209.9  | dB             |
| 36                   | Rx FLUX DENS/4kHz             | -153.7          | -144.0          | -183.3                        | -159.9  | dBW/m ^ 2/4kHz |
| 37                   | POLARIZATION LOSS             | -0.5            | -0.5            | -0.5                          | -0.5    | dB             |
| 38                   | RECEIVE ANT GAIN              | 50.1            | 2.0             | 48.4                          | 49.2    | dB             |
| 39                   | RCVD PWR / CDGrp              | -119.3          | -134.7          | -128.8                        | -123.0  | dBW            |
| 40                   | NoFade SIG PWR/ Ckt           | -143.1          | -159.1          | -152.6                        | -151.6  | dBW            |
| 41                   | NoFade N+I Terms:             |                 |                 |                               |         |                |
| 42                   | SAME CELL                     | -119.3          |                 | -128.8                        |         | dBW            |
| 43                   | OTHER CELL SIDELOBES          |                 | -133.2          | -129.0                        |         | dBW            |
| 44                   | XPOND'D N+I                   |                 | -134.7          |                               | -123.0  | dBW            |
| 45                   | TOTAL NoFade PATH N+I         | -119.3          | -130.9          | -125.9                        | -123.0  | dBW            |
| 46                   | UNCOMP. FADE ALLOWANCE        | 0.0             | 4.0             | 1.0                           | 0.0     | dB             |
| 47                   | FadeMin NOISE , Nf            | -119.3          | -134.9          | -126.9                        | -123.0  | dBW            |
| 48                   | FadeMin RCVD SIG PWR/Ckt, S1  | -143.1          | -163.1          | -153.6                        | -151.6  | dBW            |
| 49                   | RCVR NOISE FIGURE             | 4.2             | 3.1             | 2.6                           | 4.2     | dB             |
| 50                   | RCVR NOISE (Non-Fade)         | 479.8           | 302.1           | 237.7                         | 479.8   | deg K          |
| 51                   | ANTENNA NOISE (Non-Fade)      | 290.0           | 270.0           | 290.0                         | 80.0    | deg K          |
| 52                   | LOCAL NOISE, NI, in Bspread   | -128.0          | -129.3          | -129.6                        | -129.4  | dBW            |
| 53                   | FadeMin TOT NOISE, Nt=Nf+NI   | -118.7          | -128.2          | -125.1                        | -122.1  | dBW            |
| 54                   | Rx SYSTEM G/T, pk on ctr      | 21.3            | -25.6           | 23.7                          | 21.7    |                |
| 55                   | FadeMin TOT (S+N+I), P=S1+Nt  | -118.7          | -128.2          | -125.0                        | -122.1  | dBW            |
| 56                   | S1/P = Signal/Pwr Fraction    | -24.4           |                 | -28.6                         |         | dB             |
| 57                   | Nt/P = Noise/Pwr Fraction     | -0.0            |                 | -0.0                          |         | dB             |
| 58                   | VOICE DUTY CYCLE              |                 | 0.35            |                               | 0.35    | -              |
| 59                   | Eb (FadeMin, Avg On pk)       |                 | -195.5          |                               | -184.0  | dBW/Hz         |
| 60                   | No, N+I PSD, FadeMin          |                 | -200.0          |                               | -193.9  | dBW/Hz         |
| 61                   | Eb/No, fade min               |                 | 4.5             |                               | 9.9     | dB             |
| 62                   | Eb/Nt, req'd                  |                 | 4.0             |                               | 4.0     | dB             |
| 63                   | MODEM IMP LOSS, M             |                 | 0.5             |                               | 0.5     | dB             |
| 64                   | EXCESS MARGIN at fade min     |                 | 0.0             |                               | 5.4     | dB             |

TABLE E-6

TABLE 1. SATELLITE LINK POWER BUDGET  
FLUX DENSITY LIMITED

ONE SATELLITE CASE  
PRIMARY FREQUENCY REQUEST

| MSAT POWER BUDGET 10 |                               | 01/17/92        | 14:25           | PER SATELLITE EXCEPT AS NOTED |         |                          |
|----------------------|-------------------------------|-----------------|-----------------|-------------------------------|---------|--------------------------|
| 7                    | DC PWR TO S-BAND DOWNLINK     | 1643            | W               | SPRD BW                       | 15.00   | MH (Sat Total)           |
| 8                    | SAT-MOBL DOWNLINK AMP EFF.    | 0.35            |                 | BKHL BW                       | 150.0   | MHz                      |
| 9                    | SAT-MOBL RF PWR, TOTAL        | 574.9           | W               | FAST FADE                     | 4.0     | dB (One Way)             |
| 10                   | #US CELLS (inc AK, HI, PR/VI) | 112             |                 | DATA RATE                     | 5000    | bps/ckt                  |
| 11                   | # VOICE CKTS PER CELL (CD GR  | 241             |                 | # SATS.                       | 1       |                          |
| 12                   | # CD GRP/CLUSTER (BKHL MPX)   | 10              |                 | # US CKTS                     | 26967   |                          |
| 13                   | # CLUSTER PER CONUS           | 12              |                 | FORD MAR                      | 0.0     | dB                       |
| 14                   | # 1.25 SUBBANDS/GRP           | 12              | 10.0            | RET MARG                      | 5.4     | dB                       |
| 15                   |                               | HUB > SAT > MOB | ILE > SAT > HUB |                               |         |                          |
| 16                   |                               | UP              | DOWN            | UP                            | DOWN    |                          |
| 17                   | FREQUENCY                     | 29900.0         | 2110.0          | 2410.0                        | 20100.0 | MHz                      |
| 18                   | SAT REFLECTOR, DIA.           | 1.5             | 20.0            | 20.0                          | 2.0     | m                        |
| 19                   | ILLUM. FACTOR                 | 0.49            | 0.49            | 0.49                          | 0.49    |                          |
| 20                   | 3dB BMW                       | 0.43            | 0.51            | 0.44                          | 0.46    | deg                      |
| 21                   | CELL MAJOR DIAM               |                 | 0.51            | 0.51                          |         | deg                      |
| 22                   | MAJOR DIAM XOVER PT           |                 | 3.0             | 3.9                           |         | dB                       |
| 23                   | AVG OFF CTR. LOSS             | 0.2             | 2.0             | 2.6                           | 0.2     | dB                       |
| 24                   | AVG IN-CELL GAIN              | 50.1            | 47.8            | 48.4                          | 49.2    | dB                       |
| 25                   | TOTAL BEAM INTERF FACTOR      | 0.0             | 2.4             | 1.9                           | 0.0     | PwrFactor                |
| 26                   | # US BEAMS/ SAT               | 12              | 112             | 112                           | 12      |                          |
| 27                   | # CD GRP/BEAM                 | 10              | 1               | 1                             | 10      |                          |
| 28                   | # Tx/ CD GRP/ SAT             | 1               | 1               | 241                           | 1       |                          |
| 29                   | # CIRCUITS/ BEAM              | 2408            | 241             | 1                             | 2408    | CIRCUITS                 |
| 30                   | RF PWR/ Tx                    | 0.5             | 5.1             | 0.1                           | 0.1     | W                        |
| 31                   | CIRCUIT LOSS                  | -2.7            | -0.8            | -1.0                          | -1.0    | dB                       |
| 32                   | ANT RF POWER/ Tx              | -5.7            | 6.3             | -11.0                         | -11.0   | dBW                      |
| 33                   | TRANSMIT ANT GAIN             | 50.1            | 47.8            | 2.0                           | 49.2    | dB                       |
| 34                   | EIRP / CDGrp                  | 44.4            | 54.1            | 14.8                          | 38.2    | dBW                      |
| 35                   | FREE SPACE PATH LOSS, Lb      | -213.3          | -190.3          | -191.5                        | -209.9  | dB                       |
| 36                   | Rx FLUX DENS/4kHz             | -153.7          | -144.0          | -183.3                        | -159.9  | dBW/m <sup>2</sup> /4kHz |
| 37                   | POLARIZATION LOSS             | -0.5            | -0.5            | -0.5                          | -0.5    | dB                       |
| 38                   | RECEIVE ANT GAIN              | 50.1            | 2.0             | 48.4                          | 49.2    | dB                       |
| 39                   | RCVD PWR / CDGrp              | -119.3          | -134.7          | -128.8                        | -123.0  | dBW                      |
| 40                   | NoFade SIG PWR/ Ckt           | -143.1          | -159.1          | -152.6                        | -151.6  | dBW                      |
| 41                   | NoFade N+I Terms:             |                 |                 |                               |         |                          |
| 42                   | SAME CELL                     | -119.3          |                 | -128.8                        |         | dBW                      |
| 43                   | OTHER CELL SIDELOBES          |                 | -133.2          | -129.0                        |         | dBW                      |
| 44                   | XPOND'D N+I                   |                 | -134.7          |                               | -123.0  | dBW                      |
| 45                   | TOTAL NoFade PATH N+I         | -119.3          | -130.9          | -125.9                        | -123.0  | dBW                      |
| 46                   | UNCOMP. FADE ALLOWANCE        | 0.0             | 4.0             | 1.0                           | 0.0     | dB                       |
| 47                   | FadeMin NOISE , Nf            | -119.3          | -134.9          | -126.9                        | -123.0  | dBW                      |
| 48                   | FadeMin RCVD SIG PWR/Ckt, S1  | -143.1          | -163.1          | -153.6                        | -151.6  | dBW                      |
| 49                   | RCVR NOISE FIGURE             | 4.2             | 3.1             | 2.6                           | 4.2     | dB                       |
| 50                   | RCVR NOISE (Non-Fade)         | 479.8           | 302.1           | 237.7                         | 479.8   | deg K                    |
| 51                   | ANTENNA NOISE (Non-Fade)      | 290.0           | 270.0           | 290.0                         | 80.0    | deg K                    |
| 52                   | LOCAL NOISE, NI, in Bspread   | -128.0          | -129.3          | -129.6                        | -129.4  | dBW                      |
| 53                   | FadeMin TOT NOISE, Nt=Nf+NI   | -118.7          | -128.2          | -125.1                        | -122.1  | dBW                      |
| 54                   | Rx SYSTEM G/T, pk on ctr      | 21.3            | -25.6           | 23.7                          | 21.7    |                          |
| 55                   | FadeMin TOT (S+N+I), P=S1+Nt  | -118.7          | -128.2          | -125.0                        | -122.1  | dBW                      |
| 56                   | S1/P = Signal/Pwr Fraction    | -24.4           |                 | -28.6                         |         | dB                       |
| 57                   | Nt/P = Noise/Pwr Fraction     | -0.0            |                 | -0.0                          |         | dB                       |
| 58                   | VOICE DUTY CYCLE              |                 | 0.35            |                               | 0.35    | -                        |
| 59                   | Eb (FadeMin, Avg On pk)       |                 | -195.5          |                               | -184.0  | dBW/Hz                   |
| 60                   | No, N+I PSD, FadeMin          |                 | -200.0          |                               | -193.9  | dBW/Hz                   |
| 61                   | Eb/No, fade min               |                 | 4.5             |                               | 9.9     | dB                       |
| 62                   | Eb/Nt, req'd                  |                 | 4.0             |                               | 4.0     | dB                       |
| 63                   | MODEM IMP LOSS, M             |                 | 0.5             |                               | 0.5     | dB                       |
| 64                   | EXCESS MARGIN at fade min     |                 | 0.0             |                               | 5.4     | dB                       |

TABLE E-7

TABLE 1. SATELLITE LINK POWER BUDGET  
FLUX DENSITY LIMITED

TWO SATELLITE CASE  
ALTERNAT FREQUENCY REQUEST

| MSAT POWER BUDGET | 10                            | 01/17/92 | 14:26  | PER SATELLITE EXCEPT AS NOTED |                 |                |
|-------------------|-------------------------------|----------|--------|-------------------------------|-----------------|----------------|
| 7                 | DC PWR TO S-BAND DOWNLINK     | 657      | W      | SPRD BW                       | 12.50           | MH (Sat Total) |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35     |        | BKHL BW                       | 125.0           | MHz            |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 230.0    | W      | FAST FADE                     | 4.0             | dB (One Way)   |
| 10                | #US CELLS (inc AK, HI, PR/WI) | 149      |        | DATA RATE                     | 5000            | bps/ckt        |
| 11                | # VOICE CKTS PER CELL (CD GR  | 157      |        | # SATS.                       | 2               |                |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10       |        | # US CKTS                     | 23430           |                |
| 13                | # CLUSTER PER CONUS           | 15       |        | FORD MAR                      | 0.0             | dB             |
| 14                | # 1.25 SUBBANDS/GRP           | 10       | 10.0   | RET MARG                      | 4.2             | dB             |
| 15                |                               |          |        | HUB > SAT > MOB               | ILE > SAT > HUB |                |
| 16                |                               |          |        | UP                            | DOWN            |                |
| 17                | FREQUENCY                     | 29900.0  | 2483.5 | 1610.0                        | 20100.0         | MHz            |
| 18                | SAT REFLECTOR, DIA.           | 1.5      | 20.0   | 20.0                          | 2.0             | m              |
| 19                | ILLUM. FACTOR                 | 0.49     | 0.49   | 0.49                          | 0.49            |                |
| 20                | 3dB BMW                       | 0.43     | 0.43   | 0.67                          | 0.46            | deg            |
| 21                | CELL MAJOR DIAM               |          |        | 0.43                          |                 | deg            |
| 22                | MAJOR DIAM XOVER PT           |          |        | 0.43                          |                 | dB             |
| 23                | Avg OFF CTR. LOSS             | 0.2      | 2.0    | 0.8                           | 0.2             | dB             |
| 24                | Avg IN-CELL GAIN              | 50.1     | 49.2   | 46.6                          | 49.2            | dB             |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0      | 2.4    | 4.3                           | 0.0             | PwrFactor      |
| 26                | # US BEAMS/ SAT               | 8        | 149    | 149                           | 8               |                |
| 27                | # CD GRP/BEAM                 | 10       | 1      | 1                             | 10              |                |
| 28                | # Tx/ CD GRP/ SAT             | 1        | 1      | 157                           | 1               |                |
| 29                | # CIRCUITS/ BEAM              | 1572     | 157    | 1                             | 1572            | CIRCUITS       |
| 30                | RF PWR/ Tx                    | 0.5      | 3.1    | 0.1                           | 0.1             | W              |
| 31                | CIRCUIT LOSS                  | -2.7     | -0.8   | -1.0                          | -1.0            | dB             |
| 32                | ANT RF POWER/ Tx              | -5.7     | 4.1    | -11.0                         | -11.0           | dBW            |
| 33                | TRANSMIT ANT GAIN             | 50.1     | 49.2   | 2.0                           | 49.2            | dB             |
| 34                | EIRP / CDGrp                  | 44.4     | 53.3   | 13.0                          | 38.2            | dBW            |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3   | -191.7 | -188.0                        | -209.9          | dB             |
| 36                | Rx FLUX DENS/4kHz             | -152.9   | -144.0 | -184.4                        | -159.1          | dBW/m ^ 2/4kHz |
| 37                | POLARIZATION LOSS             | -0.5     | -0.5   | -0.5                          | -0.5            | dB             |
| 38                | RECEIVE ANT GAIN              | 50.1     | 2.0    | 46.6                          | 49.2            | dB             |
| 39                | RCVD PWR / CDGrp              | -119.3   | -136.9 | -128.9                        | -123.0          | dBW            |
| 40                | NoFade SIG PWR/ Ckt           | -141.2   | -159.3 | -150.8                        | -152.1          | dBW            |
| 41                | NoFade N+I Terms:             |          |        |                               |                 |                |
| 42                | SAME CELL                     | -119.3   |        | -128.9                        |                 | dBW            |
| 43                | OTHER CELL SIDELOBES          |          | -135.4 | -123.7                        |                 | dBW            |
| 44                | XPOND'D N+I                   |          | -136.9 |                               | -123.0          | dBW            |
| 45                | TOTAL NoFade PATH N+I         | -119.3   | -133.1 | -122.5                        | -123.0          | dBW            |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0      | 4.0    | 1.0                           | 0.0             | dB             |
| 47                | FadeMin NOISE , Nf            | -119.3   | -137.1 | -123.5                        | -123.0          | dBW            |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -141.2   | -163.3 | -151.8                        | -152.1          | dBW            |
| 49                | RCVR NOISE FIGURE             |          | 4.2    | 3.1                           | 2.6             | dB             |
| 50                | RCVR NOISE (Non-Fade)         | 479.8    | 302.1  | 237.7                         | 479.8           | deg K          |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0    | 270.0  | 290.0                         | 80.0            | deg K          |
| 52                | LOCAL NOISE, NI, in Espread   | -128.8   | -130.1 | -130.4                        | -130.2          | dBW            |
| 53                | FadeMin TOT NOISE, Nt=Nf+NI   | -118.8   | -129.3 | -122.7                        | -122.3          | dBW            |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3     | -25.6  | 20.2                          | 21.7            |                |
| 55                | FadeMin TOT (S+N+A, P=S1+Nt   | -118.8   | -129.3 | -122.7                        | -122.2          | dBW            |
| 56                | S1/P = Signal/Pwr Fraction    | -22.4    |        | -29.1                         |                 | dB             |
| 57                | N/P = Noise/Pwr Fraction      | -0.0     |        | -0.0                          |                 | dB             |
| 58                | VOICE DUTY CYCLE              |          |        | 0.35                          | 0.35            | -              |
| 59                | Eb (FadeMin, Avg On ck)       |          |        | -195.8                        | -184.6          | dBW/Hz         |
| 60                | No, N+I PSD, FadeMin          |          |        | -200.3                        | -193.2          | dBW/Hz         |
| 61                | Eb/No, fade min               |          |        | 4.5                           | 8.7             | dB             |
| 62                | Eb/Nt, req'd                  |          |        | 4.0                           | 4.0             | dB             |
| 63                | MODEM IMP LOSS, M             |          |        | 0.5                           | 0.5             | dB             |
| 64                | EXCESS MARGIN at fade min     |          |        | 0.0                           | 4.2             | dB             |

TABLE E-8

TABLE 1. SATELLITE LINK POWER BUDGET  
FLUX DENSITY LIMITED

| MSAT POWER BUDGET |                               | 10      | 01/17/92 | 14:26           | PER SATELLITE EXCEPT AS NOTED |                |                   |
|-------------------|-------------------------------|---------|----------|-----------------|-------------------------------|----------------|-------------------|
| 7                 | DC PWR TO S-BAND DOWNLNK      | 1315    | W        | SPRD BW         | 12.50                         | MH (Sat Total) | 10 *1.25 MHz      |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35    |          | BKHL BW         | 125.0                         | MHz            |                   |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 460.1   | W        | FAST FADE       | 4.0                           | dB (One Way)   |                   |
| 10                | #US CELLS (inc AK, HI, PR/VI) | 149     |          | DATA RATE       | 5000                          | bps/ckt        |                   |
| 11                | # VOICE CKTS PER CELL (CD GR  | 157     |          | # SATS.         | 1                             |                |                   |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10      |          | # US CKTS       | 23430                         |                |                   |
| 13                | # CLUSTER PER CONUS           | 15      |          | FOR'D MAR       | 0.0                           | dB             | 0.000 dB          |
| 14                | # 1.25 SUBBANDS/GRP           | 10      | 10.0     | RET MARG        | 4.2                           | dB             | 4.158 dB          |
| 15                | HUB > SAT > MOB               |         |          | ILE > SAT > HUB |                               |                |                   |
| 16                | UP                            | DOWN    |          | UP              | DOWN                          |                |                   |
| 17                | FREQUENCY                     | 29900.0 | 2483.5   | 1610.0          | 20100.0                       | MHz            | 2 FREQ ALTERNATE  |
| 18                | SAT REFLECTOR, DIA.           | 1.5     | 20.0     | 20.0            | 2.0                           | m              |                   |
| 19                | ILLUM. FACTOR                 | 0.49    | 0.49     | 0.49            | 0.49                          |                | CELL MAJ DIAM     |
| 20                | 3dB BMW                       | 0.43    | 0.43     | 0.67            | 0.46                          | deg            | 174 sm (E-W)      |
| 21                | CELL MAJOR DIAM               |         | 0.43     | 0.43            |                               | deg            |                   |
| 22                | MAJOR DIAM XOVER PT           |         | 3.0      | 1.3             |                               | dB             |                   |
| 23                | AVG OFF CTR. LOSS             | 0.2     | 2.0      | 0.8             | 0.2                           | dB             |                   |
| 24                | AVG IN-CELL GAIN              | 50.1    | 49.2     | 46.6            | 49.2                          | dB             | TOTAL US CKTS     |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0     | 2.4      | 4.3             | 0.0                           | PwrFactor      | 23430             |
| 26                | # US BEAMS/ SAT               | 15      | 149      | 149             | 15                            |                | TOTAL CONUS CKTS  |
| 27                | # CD GRP/BEAM                 | 10      | 1        | 1               | 10                            |                | 22958 FOR         |
| 28                | # Tx/ CD GRP/ SAT             | 1       | 1        | 157             | 1                             |                | 1 SATELLITE(S)    |
| 29                | # CIRCUITS/ BEAM              | 1572    | 157      | 1               | 1572                          | CIRCUITS       |                   |
| 30                | RF PWR/ Tx                    | 0.5     | 3.1      | 0.1             | 0.1                           | W              | K-BAND POWER/ SAT |
| 31                | CIRCUIT LOSS                  | -2.7    | -0.8     | -1.0            | -1.0                          | dB             | 15.0 W RF         |
| 32                | ANT RF POWER/ Tx              | -5.7    | 4.1      | -11.0           | -11.0                         | dBW            | 42.9 W DC         |
| 33                | TRANSMIT ANT GAIN             | 50.1    | 49.2     | 2.0             | 49.2                          | dB             | TOTAL PWR/ SAT    |
| 34                | EIRP / CDGrp                  | 44.4    | 53.3     | 13.0            | 38.2                          | dBW            | 475 W RF          |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3  | -191.7   | -188.0          | -209.9                        | dB             | 1357 W DC         |
| 36                | Rx FLUX DENS/4kHz             | -152.9  | -144.0   | -184.4          | -159.1                        | dBW/m^2/4KHz   |                   |
| 37                | POLARIZATION LOSS             | -0.5    | -0.5     | -0.5            | -0.5                          | dB             |                   |
| 38                | RECEIVE ANT GAIN              | 50.1    | 2.0      | 46.6            | 49.2                          | dB             |                   |
| 39                | RCVD PWR / CDGrp              | -119.3  | -136.9   | -128.9          | -123.0                        | dBW            |                   |
| 40                | NoFade SIG PWR/ Ckt           | -141.2  | -159.3   | -150.8          | -152.1                        | dBW            |                   |
| 41                | NoFade N+I Terms:             |         |          |                 |                               |                |                   |
| 42                | SAME CELL                     | -119.3  |          | -128.9          |                               | dBW            |                   |
| 43                | OTHER CELL SIDELOBES          |         | -135.4   | -123.7          |                               | dBW            |                   |
| 44                | XPOND'D N+I                   |         | -136.9   |                 | -123.0                        | dBW            |                   |
| 45                | TOTAL NoFade PATH N+I         | -119.3  | -133.1   | -122.5          | -123.0                        | dBW            |                   |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0     | 4.0      | 1.0             | 0.0                           | dB             |                   |
| 47                | FadeMin NOISE , Nf            | -119.3  | -137.1   | -123.5          | -123.0                        | dBW            |                   |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -141.2  | -163.3   | -151.8          | -152.1                        | dBW            |                   |
| 49                | RCVR NOISE FIGURE             | 4.2     | 3.1      | 2.6             | 4.2                           | dB             |                   |
| 50                | RCVR NOISE (Non-Fade)         | 479.8   | 302.1    | 237.7           | 479.8                         | deg K          |                   |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0   | 270.0    | 290.0           | 80.0                          | deg K          |                   |
| 52                | LOCAL NOISE, Nl, in Bspread   | -128.8  | -130.1   | -130.4          | -130.2                        | dBW            |                   |
| 53                | FadeMin TOT NOISE, Nt=Nf+Nl   | -118.8  | -129.3   | -122.7          | -122.3                        | dBW            |                   |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3    | -25.6    | 20.2            | 21.7                          |                |                   |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.8  | -129.3   | -122.7          | -122.2                        | dBW            |                   |
| 56                | S1/P = Signal/Pwr Fraction    | -22.4   |          | -29.1           |                               | dB             |                   |
| 57                | Nt/P = Noise/Pwr Fraction     | -0.0    |          | -0.0            |                               | dB             |                   |
| 58                | VOICE DUTY CYCLE              |         | 0.35     |                 | 0.35                          | -              |                   |
| 59                | Eb (FadeMin, Avg On pk)       |         | -195.8   |                 | -184.6                        | dBW/Hz         |                   |
| 60                | No, N+I PSD, FadeMin          |         | -200.3   |                 | -193.2                        | dBW/Hz         |                   |
| 61                | Eb/No, fade min               |         | 4.5      |                 | 8.7                           | dB             |                   |
| 62                | Eb/Nt, req'd                  |         | 4.0      |                 | 4.0                           | dB             |                   |
| 63                | MODEM IMP LOSS, M             |         | 0.5      |                 | 0.5                           | dB             |                   |
| 64                | EXCESS MARGIN at fade min     |         | 0.0      |                 | 4.2                           | dB             |                   |

TABLE E-9

TABLE 1. SATELLITE LINK POWER BUDGET  
PRIME POWER LIMITED

TWO SATELLITE CASE  
PRIMARY FREQUENCY REQUEST

| MSAT POWER BUDGET |                               | 10      | 01/17/92        | 14:28     | PER SATELLITE EXCEPT AS NOTED |                |                   |
|-------------------|-------------------------------|---------|-----------------|-----------|-------------------------------|----------------|-------------------|
| 7                 | DC PWR TO S-BAND DOWNLINK     | 2300    | W               | SPRD BW   | 17.50                         | MHz            | (Sat Total)       |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35    |                 | BKHL BW   | 175.0                         | MHz            |                   |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 805.0   | W               | FAST FADE | 4.0                           | dB             | (One Way)         |
| 10                | #US CELLS (inc AK, HI, PR/VI) | 112     |                 | DATA RATE | 5000                          | bps/ckt        |                   |
| 11                | # VOICE CKTS PER CELL (CD GR  | 507     |                 | # SATS.   | 2                             |                |                   |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10      |                 | # US CKTS | 56789                         |                |                   |
| 13                | # CLUSTER PER CONUS           | 12      |                 | FORD MAR  | 0.0                           | dB             |                   |
| 14                | # 1.25 SUBBANDS/GRP           | 14      | 10.0            | RET MARG  | 3.4                           | dB             |                   |
| 15                | HUB > SAT > MOB               |         | ILE > SAT > HUB |           |                               |                |                   |
| 16                | UP                            | DOWN    | UP              | DOWN      |                               |                |                   |
| 17                | FREQUENCY                     | 29900.0 | 2110.0          | 2410.0    | 20100.0                       | MHz            | 1 FREQ ALTERNATE  |
| 18                | SAT REFLECTOR, DIA.           | 1.5     | 20.0            | 20.0      | 2.0                           | m              |                   |
| 19                | ILLUM. FACTOR                 | 0.49    | 0.49            | 0.49      | 0.49                          |                |                   |
| 20                | 3dB BMW                       | 0.43    | 0.51            | 0.44      | 0.46                          | deg            | CELL MAJ DIAM     |
| 21                | CELL MAJOR DIAM               |         | 0.51            | 0.51      |                               | deg            | 204 sm (E-W)      |
| 22                | MAJOR DIAM XOVER PT           |         | 3.0             | 3.9       |                               | dB             |                   |
| 23                | AVG OFF CTR. LOSS             | 0.2     | 2.0             | 2.6       | 0.2                           | dB             |                   |
| 24                | AVG IN-CELL GAIN              | 50.1    | 47.8            | 48.4      | 49.2                          | dB             | TOTAL US CKTS     |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0     | 2.4             | 1.9       | 0.0                           | PwrFactor      | 56789             |
| 26                | # US BEAMS/ SAT               | 6       | 112             | 112       | 6                             |                | TOTAL CONUS CKTS  |
| 27                | # CD GRP/BEAM                 | 10      | 1               | 1         | 10                            |                | 55268 FOR         |
| 28                | # Tx/ CD GRP/ SAT             | 1       | 1               | 507       | 1                             |                | 2 SATELLITE(S)    |
| 29                | # CIRCUITS/ BEAM              | 5070    | 507             | 1         | 5070                          | CIRCUITS       |                   |
| 30                | RF PWR/ Tx                    | 0.5     | 14.4            | 0.1       | 0.1                           | W              | K-BAND POWER/ SAT |
| 31                | CIRCUIT LOSS                  | -2.7    | -0.8            | -1.0      | -1.0                          | dB             | 3.0 W RF          |
| 32                | ANT RF POWER/ Tx              | -5.7    | 10.8            | -11.0     | -11.0                         | dBW            | 8.6 W DC          |
| 33                | TRANSMIT ANT GAIN             | 50.1    | 47.8            | 2.0       | 49.2                          | dB             | TOTAL PWR/ SAT    |
| 34                | EIRP / CDGrp                  | 44.4    | 58.6            | 18.1      | 38.2                          | dBW            | 808 W RF          |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3  | -190.3          | -191.5    | -209.9                        | dB             | 2309 W DC         |
| 36                | Rx FLUX DENS/4kHz             | -154.4  | -140.2          | -180.7    | -160.6                        | dBW/m ^ 2/4kHz |                   |
| 37                | POLARIZATION LOSS             | -0.5    | -0.5            | -0.5      | -0.5                          | dB             |                   |
| 38                | RECEIVE ANT GAIN              | 50.1    | 2.0             | 48.4      | 49.2                          | dB             |                   |
| 39                | RCVD PWR / CDGrp              | -119.3  | -130.2          | -125.6    | -123.0                        | dBW            |                   |
| 40                | NoFade SIG PWR/ Ckt           | -146.3  | -157.9          | -152.6    | -154.1                        | dBW            |                   |
| 41                | NoFade N+I Terms:             |         |                 |           |                               |                |                   |
| 42                | SAME CELL                     | -119.3  |                 | -125.6    |                               | dBW            |                   |
| 43                | OTHER CELL SIDELOBES          |         | -128.7          | -125.8    |                               | dBW            |                   |
| 44                | XPOND'D N+I                   |         | -130.2          |           | -123.0                        | dBW            |                   |
| 45                | TOTAL NoFade PATH N+I         | -119.3  | -126.4          | -122.7    | -123.0                        | dBW            |                   |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0     | 4.0             | 1.0       | 0.0                           | dB             |                   |
| 47                | FadeMin NOISE , Nf            | -119.3  | -130.4          | -123.7    | -123.0                        | dBW            |                   |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -146.3  | -161.9          | -153.6    | -154.1                        | dBW            |                   |
| 49                | RCVR NOISE FIGURE             | 4.2     | 3.1             | 2.6       | 4.2                           | dB             |                   |
| 50                | RCVR NOISE (Non-Fade)         | 479.8   | 302.1           | 237.7     | 479.8                         | deg K          |                   |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0   | 270.0           | 290.0     | 80.0                          | deg K          |                   |
| 52                | LOCAL NOISE, Nl, in Bsspread  | -127.3  | -128.6          | -129.0    | -128.7                        | dBW            |                   |
| 53                | FadeMin TOT NOISE, Nt=Nf+Nl   | -118.6  | -126.4          | -122.5    | -122.0                        | dBW            |                   |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3    | -25.6           | 23.7      | 21.7                          |                |                   |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.6  | -126.4          | -122.5    | -122.0                        | dBW            |                   |
| 56                | S1/P = Signal/Pwr Fraction    | -27.7   |                 | -31.1     |                               | dB             |                   |
| 57                | Nt/P = Noise/Pwr Fraction     | -0.0    |                 | -0.0      |                               | dB             |                   |
| 58                | VOICE DUTY CYCLE              |         | 0.35            |           | 0.35                          | -              |                   |
| 59                | Eb (FadeMin, Avg On pk)       |         | -194.3          |           | -186.5                        | dBW/Hz         |                   |
| 60                | No, N+I PSD, FadeMin          |         | -198.8          |           | -194.4                        | dBW/Hz         |                   |
| 61                | Eb/No, fade min               |         | 4.5             |           | 7.9                           | dB             |                   |
| 62                | Eb/Nt, req'd                  |         | 4.0             |           | 4.0                           | dB             |                   |
| 63                | MODEM IMP LOSS, M             |         | 0.5             |           | 0.5                           | dB             |                   |
| 64                | EXCESS MARGIN at fade min     |         | 0.0             |           | 3.4                           | dB             |                   |

TABLE E-10

TABLE 1. SATELLITE LINK POWER BUDGET  
PRIME POWER LIMITED

CNE SATELLITE CASE  
PRIMARY FREQUENCY REQUEST

10 MODE

| MSAT POWER BUDGET | 10                            | 01/17/92 | 14:28           | PER SATELLITE EXCEPT AS NOTED |         |                 |
|-------------------|-------------------------------|----------|-----------------|-------------------------------|---------|-----------------|
| 7                 | DC PWR TO S-BAND DOWNLINK     | 2300     | W               | SPRD BW                       | 17.50   | MHz (Sat Total) |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35     |                 | BKHL BW                       | 175.0   | MHz             |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 805.0    | W               | FAST FADE                     | 4.0     | dB (One Way)    |
| 10                | #US CELLS (inc AK, HI, PR/VI) | 112      |                 | DATA RATE                     | 5000    | bps/ckt         |
| 11                | # VOICE CKTS PER CELL (CD GR  | 317      |                 | # SATS.                       | 1       |                 |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10       |                 | # US CKTS                     | 35485   |                 |
| 13                | # CLUSTER PER CONUS           | 12       |                 | FORD MAR                      | 0.0     | dB              |
| 14                | # 1.25 SUBBANDS/GRP           | 14       | 10.0            | RET MARG                      | 4.9     | dB              |
| 15                | HUB > SAT > MOB               |          | ILE > SAT > HUB |                               |         |                 |
| 16                | UP                            | DOWN     | UP              | DOWN                          |         |                 |
| 17                | FREQUENCY                     | 29900.0  | 2110.0          | 2410.0                        | 20100.0 | MHz             |
| 18                | SAT REFLECTOR, DIA.           | 1.5      | 20.0            | 20.0                          | 2.0     | m               |
| 19                | ILLUM. FACTOR                 | 0.49     | 0.49            | 0.49                          | 0.49    |                 |
| 20                | 3dB BMW                       | 0.43     | 0.51            | 0.44                          | 0.46    | deg             |
| 21                | CELL MAJOR DIAM               |          | 0.51            | 0.51                          |         | deg             |
| 22                | MAJOR DIAM XOVER PT           |          | 3.0             | 3.9                           |         | dB              |
| 23                | AVG OFF CTR. LOSS             | 0.2      | 2.0             | 2.6                           | 0.2     | dB              |
| 24                | AVG IN-CELL GAIN              | 50.1     | 47.8            | 48.4                          | 49.2    | dB              |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0      | 2.4             | 1.9                           | 0.0     | PwrFactor       |
| 26                | # US BEAMS/ SAT               | 12       | 112             | 112                           | 12      |                 |
| 27                | # CD GRP/BEAM                 | 10       | 1               | 1                             | 10      |                 |
| 28                | # Tx/ CD GRP/ SAT             | 1        | 1               | 317                           | 1       |                 |
| 29                | # CIRCUITS/ BEAM              | 3168     | 317             | 1                             | 3168    | CIRCUITS        |
| 30                | RF PWR/ Tx                    | 0.5      | 7.2             | 0.1                           | 0.1     | W               |
| 31                | CIRCUIT LOSS                  | -2.7     | -0.8            | -1.0                          | -1.0    | dB              |
| 32                | ANT RF POWER/ Tx              | -5.7     | 7.8             | -11.0                         | -11.0   | dBW             |
| 33                | TRANSMIT ANT GAIN             | 50.1     | 47.8            | 2.0                           | 49.2    | dB              |
| 34                | EIRP / CDGrp                  | 44.4     | 55.6            | 16.0                          | 38.2    | dBW             |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3   | -190.3          | -191.5                        | -209.9  | dB              |
| 36                | Rx FLUX DENS/4kHz             | -154.4   | -143.2          | -182.8                        | -160.6  | dBW/m ^ 2/4KHz  |
| 37                | POLARIZATION LOSS             | -0.5     | -0.5            | -0.5                          | -0.5    | dB              |
| 38                | RECEIVE ANT GAIN              | 50.1     | 2.0             | 48.4                          | 49.2    | dB              |
| 39                | RCVD PWR / CDGrp              | -119.3   | -133.2          | -127.6                        | -123.0  | dBW             |
| 40                | NoFade SIG PWR/ Ckt           | -144.3   | -158.9          | -152.6                        | -152.6  | dBW             |
| 41                | NoFade N+I Terms:             |          |                 |                               |         |                 |
| 42                | SAME CELL                     | -119.3   |                 | -127.6                        |         | dBW             |
| 43                | OTHER CELL SIDELOBES          |          | -131.7          | -127.8                        |         | dBW             |
| 44                | XPOND'D N+I                   |          | -133.2          |                               | -123.0  | dBW             |
| 45                | TOTAL NoFade PATH N+I         | -119.3   | -129.4          | -124.7                        | -123.0  | dBW             |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0      | 4.0             | 1.0                           | 0.0     | dB              |
| 47                | FadeMin NOISE , Nf            | -119.3   | -133.4          | -125.7                        | -123.0  | dBW             |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -144.3   | -162.9          | -153.6                        | -152.6  | dBW             |
| 49                | RCVR NOISE FIGURE             | 4.2      | 3.1             | 2.6                           | 4.2     | dB              |
| 50                | RCVR NOISE (Non-Fade)         | 479.8    | 302.1           | 237.7                         | 479.8   | deg K           |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0    | 270.0           | 290.0                         | 80.0    | deg K           |
| 52                | LOCAL NOISE, NI, in Bspread   | -127.3   | -128.6          | -129.0                        | -128.7  | dBW             |
| 53                | FadeMin TOT NOISE, Nt=Nf+Ni   | -118.7   | -127.4          | -124.0                        | -122.0  | dBW             |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3     | -25.6           | 23.7                          | 21.7    |                 |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.6   | -127.4          | -124.0                        | -122.0  | dBW             |
| 56                | S1/P = Signal/Pwr Fraction    | -25.6    |                 | -29.6                         |         | dB              |
| 57                | Nt/P = Noise/Pwr Fraction     | -0.0     |                 | -0.0                          |         | dB              |
| 58                | VOICE DUTY CYCLE              |          | 0.35            |                               | 0.35    | -               |
| 59                | Eb (FadeMin, Avg On pk)       |          | -195.3          |                               | -185.0  | dBW/Hz          |
| 60                | No, N+I PSD, FadeMin          |          | -199.8          |                               | -194.4  | dBW/Hz          |
| 61                | Eb/No, fade min               |          | 4.5             |                               | 9.4     | dB              |
| 62                | Eb/Nt, req'd                  |          | 4.0             |                               | 4.0     | dB              |
| 63                | MODEM IMP LOSS, M             |          | 0.5             |                               | 0.5     | dB              |
| 64                | EXCESS MARGIN at fade min     |          | 0.0             |                               | 4.9     | dB              |

TABLE E-11

TABLE 1. SATELLITE LINK POWER BUDGET  
PRIME POWER LIMITEDTWO SATELLITE CASE  
ALTERNAT FREQUENCY REQUEST

11 MODE

| MSAT POWER BUDGET |                               | 10      | 01/17/92        | 14:28     | PER SATELLITE EXCEPT AS NOTED |                |                   |
|-------------------|-------------------------------|---------|-----------------|-----------|-------------------------------|----------------|-------------------|
| 7                 | DC PWR TO S-BAND DOWNLINK     | 2300    | W               | SPRD BW   | 15.00                         | MH (Sat Total) | 12 *1.25 MHz      |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35    |                 | BKHL BW   | 150.0                         | MHz            |                   |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 805.0   | W               | FAST FADE | 4.0                           | dB (One Way)   |                   |
| 10                | #US CELLS (inc AK, HI, PR/VI) | 149     |                 | DATA RATE | 5000                          | bps/ckt        |                   |
| 11                | # VOICE CKTS PER CELL (CD GR  | 409     |                 | # SATS.   | 2                             |                |                   |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10      |                 | # US CKTS | 60905                         |                |                   |
| 13                | # CLUSTER PER CONUS           | 15      |                 | FOR'D MAR | 0.0                           | dB             | 0.000 dB          |
| 14                | # 1.25 SUBBANDS/GRP           | 12      | 10.0            | RET MARG  | 1.1                           | dB             | 1.075 dB          |
| 15                |                               |         | HUB > SAT > MOB |           | ILE > SAT > HUB               |                |                   |
| 16                |                               |         | UP              | DOWN      | UP                            | DOWN           |                   |
| 17                | FREQUENCY                     | 29900.0 | 2483.5          | 1610.0    | 20100.0                       | MHz            | 2 FREQ ALTERNATE  |
| 18                | SAT REFLECTOR, DIA.           | 1.5     | 20.0            | 20.0      | 2.0                           | m              |                   |
| 19                | ILLUM. FACTOR                 | 0.49    | 0.49            | 0.49      | 0.49                          |                | CELL MAJ DIAM     |
| 20                | 3dB BMW                       | 0.43    | 0.43            | 0.67      | 0.46                          | deg            | 174 sm (E-W)      |
| 21                | CELL MAJOR DIAM               |         | 0.43            | 0.43      |                               | deg            |                   |
| 22                | MAJOR DIAM XOVER PT           |         | 3.0             | 1.3       |                               | dB             |                   |
| 23                | AVG OFF CTR. LOSS             | 0.2     | 2.0             | 0.8       | 0.2                           | dB             |                   |
| 24                | AVG IN-CELL GAIN              | 50.1    | 49.2            | 46.6      | 49.2                          | dB             | TOTAL US CKTS     |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0     | 2.4             | 4.3       | 0.0                           | PwrFactor      | 60905             |
| 26                | # US BEAMS/ SAT               | 8       | 149             | 149       | 8                             |                | TOTAL CONUS CKTS  |
| 27                | # CD GRP/BEAM                 | 10      | 1               | 1         | 10                            |                | 59679 FOR         |
| 28                | # Tx/ CD GRP/ SAT             | 1       | 1               | 409       | 1                             |                | 2 SATELLITE(S)    |
| 29                | # CIRCUITS/ BEAM              | 4088    | 409             | 1         | 4088                          | CIRCUITS       |                   |
| 30                | RF PWR/ Tx                    | 0.5     | 10.8            | 0.1       | 0.1                           | W              | K-BAND POWER/ SAT |
| 31                | CIRCUIT LOSS                  | -2.7    | -0.8            | -1.0      | -1.0                          | dB             | 4.0 W RF          |
| 32                | ANT RF POWER/ Tx              | -5.7    | 9.5             | -11.0     | -11.0                         | dBW            | 11.4 W DC         |
| 33                | TRANSMIT ANT GAIN             | 50.1    | 49.2            | 2.0       | 49.2                          | dB             | TOTAL PWR/ SAT    |
| 34                | EIRP / CDGrp                  | 44.4    | 58.8            | 17.1      | 38.2                          | dBW            | 809 W RF          |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3  | -191.7          | -188.0    | -209.9                        | dB             |                   |
| 36                | Rx FLUX DENS/4kHz             | -153.7  | -139.4          | -181.0    | -159.9                        | dBW/m ^ 2/4kHz |                   |
| 37                | POLARIZATION LOSS             | -0.5    | -0.5            | -0.5      | -0.5                          | dB             |                   |
| 38                | RECEIVE ANT GAIN              | 50.1    | 2.0             | 46.6      | 49.2                          | dB             |                   |
| 39                | RCVD PWR / CDGrp              | -119.3  | -131.5          | -124.7    | -123.0                        | dBW            |                   |
| 40                | NoFade SIG PWR/ Ckt           | -145.4  | -158.1          | -150.8    | -155.9                        | dBW            |                   |
| 41                | NoFade N+I Terms:             |         |                 |           |                               |                |                   |
| 42                | SAME CELL                     | -119.3  |                 | -124.7    |                               | dBW            |                   |
| 43                | OTHER CELL SIDELOBES          |         | -129.9          | -119.5    |                               | dBW            |                   |
| 44                | XPOND'D N+I                   |         | -131.5          |           | -123.0                        | dBW            |                   |
| 45                | TOTAL NoFade PATH N+I         | -119.3  | -127.6          | -118.4    | -123.0                        | dBW            |                   |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0     | 4.0             | 1.0       | 0.0                           | dB             |                   |
| 47                | FadeMin NOISE , Nf            | -119.3  | -131.6          | -119.4    | -123.0                        | dBW            |                   |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -145.4  | -162.1          | -151.8    | -155.9                        | dBW            |                   |
| 49                | RCVR NOISE FIGURE             | 4.2     | 3.1             | 2.6       | 4.2                           | dB             |                   |
| 50                | RCVR NOISE (Non-Fade)         | 479.8   | 302.1           | 237.7     | 479.8                         | deg K          |                   |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0   | 270.0           | 290.0     | 80.0                          | deg K          |                   |
| 52                | LOCAL NOISE, NI, in Bspread   | -128.0  | -129.3          | -129.6    | -129.4                        | dBW            |                   |
| 53                | FadeMin TOT NOISE, Nt=Nf+ Ni  | -118.7  | -127.3          | -119.0    | -122.1                        | dBW            |                   |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3    | -25.6           | 20.2      | 21.7                          |                |                   |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.7  | -127.3          | -119.0    | -122.1                        | dBW            |                   |
| 56                | S1/P = Signal/Pwr Fraction    | -26.7   |                 | -32.9     |                               | dB             |                   |
| 57                | Nt/P = Noise/Pwr Fraction     | -0.0    |                 | -0.0      |                               | dB             |                   |
| 58                | VOICE DUTY CYCLE              |         | 0.35            |           | 0.35                          | -              |                   |
| 59                | Eb (FadeMin, Avg On pk)       |         | -194.6          |           | -188.3                        | dBW/Hz         |                   |
| 60                | No, N+I PSD, FadeMin          |         | -199.1          |           | -193.9                        | dBW/Hz         |                   |
| 61                | Eb/No, fade min               |         | 4.5             |           | 5.6                           | dB             |                   |
| 62                | Eb/Nt, req'd                  |         | 4.0             |           | 4.0                           | dB             |                   |
| 63                | MODEM IMP LOSS, M             |         | 0.5             |           | 0.5                           | dB             |                   |
| 64                | EXCESS MARGIN at fade min     |         | 0.0             |           | 1.1                           | dB             |                   |

TABLE E-12

TABLE 1. SATELLITE LINK POWER BUDGET  
PRIME POWER LIMITED

ONE SATELLITE CASE  
ALTERNAT FREQUENCY REQUEST

| MSAT POWER BUDGET |                               | 10              | 01/17/92 | 14:29  | PER SATELLITE EXCEPT AS NOTED |         |                |     |                   |
|-------------------|-------------------------------|-----------------|----------|--------|-------------------------------|---------|----------------|-----|-------------------|
| 7                 | DC PWR TO S-BAND DOWNLINK     |                 | 2300     | W      | SPRD BW                       | 15.00   | MH (Sat Total) | 12  | *1.25 MHz         |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    |                 | 0.35     |        | BKHL BW                       | 150.0   | MHz            |     |                   |
| 9                 | SAT-MOBL RF PWR, TOTAL        |                 | 805.0    | W      | FAST FADE                     | 4.0     | dB (One Way)   |     |                   |
| 10                | #US CELLS (inc AK, HI, PR/VI) |                 | 149      |        | DATA RATE                     | 5000    | bps/ckt        |     |                   |
| 11                | # VOICE CKTS PER CELL (CD GR  |                 | 251      |        | # SATS.                       | 1       |                |     |                   |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   |                 | 10       |        | # US CKTS                     | 37332   |                |     |                   |
| 13                | # CLUSTER PER CONUS           |                 | 15       |        | FOR'D MAR                     | 0.0     |                |     | 0.000 dB          |
| 14                | # 1.25 SUBBANDS/GRP           |                 | 12       | 10.0   | RET MARG                      | 3.0     |                |     | 2.972 dB          |
| 15                |                               | HUB > SAT > MOB |          |        | ILE > SAT > HUB               |         |                |     |                   |
| 16                |                               | UP              | DOWN     |        | UP                            | DOWN    |                |     |                   |
| 17                | FREQUENCY                     | 29900.0         | 2483.5   |        | 1610.0                        | 20100.0 | MHz            | 2   | FREQ ALTERNATE    |
| 18                | SAT REFLECTOR, DIA.           | 1.5             | 20.0     |        | 20.0                          | 2.0     | m              |     |                   |
| 19                | ILLUM. FACTOR                 | 0.49            | 0.49     |        | 0.49                          | 0.49    |                |     |                   |
| 20                | 3dB BMW                       | 0.43            | 0.43     |        | 0.67                          | 0.46    | deg            |     | CELL MAJ DIAM     |
| 21                | CELL MAJOR DIAM               |                 |          |        | 0.43                          | 0.43    | deg            |     | 174 sm (E-W)      |
| 22                | MAJOR DIAM XOVER PT           |                 |          |        | 3.0                           | 1.3     |                |     |                   |
| 23                | AVG OFF CTR. LOSS             | 0.2             | 2.0      |        | 0.8                           | 0.2     | dB             |     |                   |
| 24                | AVG IN-CELL GAIN              | 50.1            | 49.2     |        | 46.6                          | 49.2    | dB             |     | TOTAL US CKTS     |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0             | 2.4      |        | 4.3                           | 0.0     | PwrFactor      |     | 37332             |
| 26                | # US BEAMS/ SAT               | 15              | 149      |        | 149                           | 15      |                |     | TOTAL CONUS CKTS  |
| 27                | # CD GRP/BEAM                 | 10              | 1        |        | 1                             | 10      |                |     | 36581 FOR         |
| 28                | # Tx/ CD GRP/ SAT             | 1               | 1        |        | 251                           | 1       |                |     | 1 SATELLITE(S)    |
| 29                | # CIRCUITS/ BEAM              | 2506            | 251      |        | 1                             | 2506    | CIRCUITS       |     |                   |
| 30                | RF PWR/ Tx                    | 0.5             | 5.4      |        | 0.1                           | 0.1     | W              |     | K-BAND POWER/ SAT |
| 31                | CIRCUIT LOSS                  | -2.7            | -0.8     |        | -1.0                          | -1.0    | dB             |     | 15.0 W RF         |
| 32                | ANT RF POWER/ Tx              | -5.7            | 6.5      |        | -11.0                         | -11.0   | dBW            |     | 42.9 W DC         |
| 33                | TRANSMIT ANT GAIN             | 50.1            | 49.2     |        | 2.0                           | 49.2    | dB             |     | TOTAL PWR/ SAT    |
| 34                | EIRP / CDGrp                  | 44.4            | 55.8     |        | 15.0                          | 38.2    | dBW            |     | 820 W RF          |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3          | -191.7   |        | -188.0                        | -209.9  | dB             |     | 2343 W DC         |
| 36                | Rx FLUX DENS/4kHz             | -153.7          | -142.4   |        | -183.1                        | -159.9  | dBW/m ^ 2/4KHz |     |                   |
| 37                | POLARIZATION LOSS             | -0.5            | -0.5     |        | -0.5                          | -0.5    | dB             |     |                   |
| 38                | RECEIVE ANT GAIN              | 50.1            | 2.0      |        | 46.6                          | 49.2    | dB             |     |                   |
| 39                | RCVD PWR / CDGrp              | -119.3          | -134.5   |        | -126.9                        | -123.0  | dBW            |     |                   |
| 40                | NoFade SIG PWR/ Ckt           | -143.3          | -159.0   |        | -150.8                        | -154.0  | dBW            |     |                   |
| 41                | NoFade N+I Terms:             |                 |          |        |                               |         |                |     |                   |
| 42                | SAME CELL                     | -119.3          |          |        | -126.9                        |         | dBW            |     |                   |
| 43                | OTHER CELL SIDELOBES          |                 |          |        | -133.0                        | -121.6  | dBW            |     |                   |
| 44                | XPOND'D N+I                   |                 |          |        | -134.5                        |         | -123.0         | dBW |                   |
| 45                | TOTAL NoFade PATH N+I         | -119.3          | -130.6   |        | -120.5                        | -123.0  | dBW            |     |                   |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0             | 4.0      |        | 1.0                           | 0.0     | dB             |     |                   |
| 47                | FadeMin NOISE , Nf            | -119.3          | -134.6   |        | -121.5                        | -123.0  | dBW            |     |                   |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -143.3          | -163.0   |        | -151.8                        | -154.0  | dBW            |     |                   |
| 49                | RCVR NOISE FIGURE             | 4.2             | 3.1      |        | 2.6                           | 4.2     | dB             |     |                   |
| 50                | RCVR NOISE (Non-Fade)         | 479.8           | 302.1    |        | 237.7                         | 479.8   | deg K          |     |                   |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0           | 270.0    |        | 290.0                         | 80.0    | deg K          |     |                   |
| 52                | LOCAL NOISE, NI, in Bspread   | -128.0          | -129.3   |        | -129.6                        | -129.4  | dBW            |     |                   |
| 53                | FadeMin TOT NOISE, Nt=Nf+NI   | -118.7          | -128.2   |        | -120.9                        | -122.1  | dBW            |     |                   |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3            | -25.6    |        | 20.2                          | 21.7    |                |     |                   |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.7          | -128.2   |        | -120.9                        | -122.1  | dBW            |     |                   |
| 56                | S1/P = Signal/Pwr Fraction    | -24.5           |          |        | -31.0                         |         | dB             |     |                   |
| 57                | N/P = Noise/Pwr Fraction      | -0.0            |          |        | -0.0                          |         | dB             |     |                   |
| 58                | VOICE DUTY CYCLE              |                 |          | 0.35   |                               | 0.35    | -              |     |                   |
| 59                | Eb (FadeMin, Avg On pk)       |                 |          | -195.4 |                               | -186.4  | dBW/Hz         |     |                   |
| 60                | No, N+I PSD, FadeMin          |                 |          | -199.9 |                               | -193.9  | dBW/Hz         |     |                   |
| 61                | Eb/No, fade min               |                 |          | 4.5    |                               | 7.5     | dB             |     |                   |
| 62                | Eb/Nt, req'd                  |                 |          | 4.0    |                               | 4.0     | dB             |     |                   |
| 63                | MODEM IMP LOSS, M             |                 |          | 0.5    |                               | 0.5     | dB             |     |                   |
| 64                | EXCESS MARGIN at fade min     |                 |          | 0.0    |                               | 3.0     | dB             |     |                   |

TABLE E-13

TABLE 1. SATELLITE LINK POWER BUDGET  
FLUX DENSITY LIMITED

TWO SATELLITE CASE  
PRIMARY FREQUENCY REQUEST

| MSAT POWER BUDGET                | 10      | 01/17/92 | 14:29           | PER SATELLITE EXCEPT AS NOTED |                 |                   |
|----------------------------------|---------|----------|-----------------|-------------------------------|-----------------|-------------------|
| 7 DC PWR TO S-BAND DOWNLINK      | 958     | W        | SPRD BW         | 17.50                         | MHz (Sat Total) | 14 *1.25 MHz      |
| 8 SAT-MOBL DOWNLINK AMP EFF.     | 0.35    |          | BKHL BW         | 175.0                         | MHz             |                   |
| 9 SAT-MOBL RF PWR, TOTAL         | 335.4   | W        | FAST FADE       | 4.0                           | dB (One Way)    |                   |
| 10 #US CELLS (inc AK, HI, PR/VI) | 112     |          | DATA RATE       | 5000                          | bps/ckt         |                   |
| 11 # VOICE CKTS PER CELL (CD GR) | 275     |          | # SATS.         | 2                             |                 |                   |
| 12 # CD GRP/CLUSTER (BKHL MPX)   | 10      |          | # US CKTS       | 30852                         |                 |                   |
| 13 # CLUSTER PER CONUS           | 12      |          | FOR'D MAR       | 0.0                           |                 | 0.000 dB          |
| 14 # 1.25 SUBBANDS/GRP           | 14      | 10.0     | RET MARG        | 5.3                           |                 | 5.291 dB          |
|                                  |         |          | HUB > SAT > MOB | ILE > SAT > HUB               |                 |                   |
|                                  |         |          | UP              | DOWN                          | UP              | DOWN              |
| 17 FREQUENCY                     | 29900.0 | 2110.0   | 2410.0          | 20100.0                       | MHz             | 1 FREQ ALTERNATE  |
| 18 SAT REFLECTOR, DIA.           | 1.5     | 20.0     | 20.0            | 2.0                           | m               |                   |
| 19 ILLUM. FACTOR                 | 0.49    | 0.49     | 0.49            | 0.49                          |                 |                   |
| 20 3dB BMW                       | 0.43    | 0.51     | 0.44            | 0.46                          | deg             | CELL MAJ DIAM     |
| 21 CELL MAJOR DIAM               |         | 0.51     | 0.51            |                               | deg             | 204 sm (E-W)      |
| 22 MAJOR DIAM XOVER PT           |         | 3.0      | 3.9             |                               | dB              |                   |
| 23 AVG OFF CTR. LOSS             | 0.2     | 2.0      | 2.6             | 0.2                           | dB              |                   |
| 24 AVG IN-CELL GAIN              | 50.1    | 47.8     | 48.4            | 49.2                          | dB              | TOTAL US CKTS     |
| 25 TOTAL BEAM INTERF FACTOR      | 0.0     | 2.4      | 1.9             | 0.0                           | PwrFactor       | 30852             |
| 26 # US BEAMS/ SAT               | 6       | 112      | 112             | 6                             |                 | TOTAL CONUS CKTS  |
| 27 # CD GRP/BEAM                 | 10      | 1        | 1               | 10                            |                 | 30026 FOR         |
| 28 # Tx/ CD GRP/ SAT             | 1       | 1        | 275             | 1                             |                 | 2 SATELLITE(S)    |
| 29 # CIRCUITS/ BEAM              | 2755    | 275      | 1               | 2755                          | CIRCUITS        |                   |
| 30 RF PWR/ Tx                    | 0.5     | 6.0      | 0.1             | 0.1                           | W               | K-BAND POWER/ SAT |
| 31 CIRCUIT LOSS                  | -2.7    | -0.8     | -1.0            | -1.0                          | dB              | 3.0 W RF          |
| 32 ANT RF POWER/ Tx              | -5.7    | 7.0      | -11.0           | -11.0                         | dBW             | 8.6 W DC          |
| 33 TRANSMIT ANT GAIN             | 50.1    | 47.8     | 2.0             | 49.2                          | dB              | TOTAL PWR/ SAT    |
| 34 EIRP / CDGrp                  | 44.4    | 54.8     | 15.4            | 38.2                          | dBW             | 338 W RF          |
| 35 FREE SPACE PATH LOSS, Lb      | -213.3  | -190.3   | -191.5          | -209.9                        | dB              | 967 W DC          |
| 36 Rx FLUX DENS/4kHz             | -154.4  | -144.0   | -183.4          | -160.6                        | dBW/m ^ 2/4KHz  |                   |
| 37 POLARIZATION LOSS             | -0.5    | -0.5     | -0.5            | -0.5                          | dB              |                   |
| 38 RECEIVE ANT GAIN              | 50.1    | 2.0      | 48.4            | 49.2                          | dB              |                   |
| 39 RCVD PWR / CDGrp              | -119.3  | -134.0   | -128.2          | -123.0                        | dBW             |                   |
| 40 NoFade SIG PWR/ Ckt           | -143.7  | -159.1   | -152.6          | -152.2                        | dBW             |                   |
| 41 NoFade N+I Terms:             |         |          |                 |                               |                 |                   |
| 42 SAME CELL                     | -119.3  |          | -128.2          |                               | dBW             |                   |
| 43 OTHER CELL SIDELOBES          |         | -132.5   | -128.4          |                               | dBW             |                   |
| 44 XPOND'D N+I                   |         | -134.0   |                 | -123.0                        | dBW             |                   |
| 45 TOTAL NoFade PATH N+I         | -119.3  | -130.2   | -125.3          | -123.0                        | dBW             |                   |
| 46 UNCOMP. FADE ALLOWANCE        | 0.0     | 4.0      | 1.0             | 0.0                           | dB              |                   |
| 47 FadeMin NOISE , Nf            | -119.3  | -134.2   | -126.3          | -123.0                        | dBW             |                   |
| 48 FadeMin RCVD SIG PWR/Ckt, S1  | -143.7  | -163.1   | -153.6          | -152.2                        | dBW             |                   |
| 49 RCVR NOISE FIGURE             | 4.2     | 3.1      | 2.6             | 4.2                           | dB              |                   |
| 50 RCVR NOISE (Non-Fade)         | 479.8   | 302.1    | 237.7           | 479.8                         | deg K           |                   |
| 51 ANTENNA NOISE (Non-Fade)      | 290.0   | 270.0    | 290.0           | 80.0                          | deg K           |                   |
| 52 LOCAL NOISE, NI, in Bspread   | -127.3  | -128.6   | -129.0          | -128.7                        | dBW             |                   |
| 53 FadeMin TOT NOISE, Nt=Nf+NI   | -118.7  | -127.6   | -124.4          | -122.0                        | dBW             |                   |
| 54 Rx SYSTEM G/T, pk on ctr      | 21.3    | -25.6    | 23.7            | 21.7                          |                 |                   |
| 55 FadeMin TOT (S+N+I), P=S1+Nt  | -118.6  | -127.6   | -124.4          | -122.0                        | dBW             |                   |
| 56 S1/P = Signal/Pwr Fraction    | -25.0   |          | -29.2           |                               | dB              |                   |
| 57 Nt/P = Noise/Pwr Fraction     | -0.0    |          | -0.0            |                               | dB              |                   |
| 58 VOICE DUTY CYCLE              |         | 0.35     |                 | 0.35                          | -               |                   |
| 59 Eb (FadeMin, Avg On pk)       |         | -195.5   |                 | -184.6                        | dBW/Hz          |                   |
| 60 No, N+I PSD, FadeMin          |         | -200.0   |                 | -194.4                        | dBW/Hz          |                   |
| 61 Eb/No, fade min               |         | 4.5      |                 | 9.8                           | dB              |                   |
| 62 Eb/Nt, req'd                  |         | 4.0      |                 | 4.0                           | dB              |                   |
| 63 MODEM IMP LOSS, M             |         | 0.5      |                 | 0.5                           | dB              |                   |
| 64 EXCESS MARGIN at fade min     |         | 0.0      |                 | 5.3                           | dB              |                   |

TABLE E-14

TABLE 1. SATELLITE LINK POWER BUDGET  
FLUX DENSITY LIMITEDONE SATELLITE CASE  
PRIMARY FREQUENCY REQUEST

| MSAT POWER BUDGET |                               | 10      | 01/17/92        | 14:30         | PER SATELLITE EXCEPT AS NOTED |                 |                   |
|-------------------|-------------------------------|---------|-----------------|---------------|-------------------------------|-----------------|-------------------|
| 7                 | DC PWR TO S-BAND DOWNLINK     | 1916    | W               | SPRD BW       | 17.50                         | MHz (Sat Total) | 14 *1.25 MHz      |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35    |                 | BKHL BW       | 175.0                         | MHz             |                   |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 670.8   | W               | FAST FADE     | 4.0                           | dB (One Way)    |                   |
| 10                | #US CELLS (inc AK, HI, PR/VI) | 112     |                 | DATA RATE     | 5000                          | bps/ckt         |                   |
| 11                | # VOICE CKTS PER CELL (CD GR  | 275     |                 | # SATS.       | 1                             |                 |                   |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10      |                 | # US CKTS     | 30852                         |                 |                   |
| 13                | # CLUSTER PER CONUS           | 12      |                 | FOR'D MAR 0.0 |                               | dB              | 0.000 dB          |
| 14                | # 1.25 SUBBANDS/GRP           | 14      | 10.0            | RET MARG      | 5.3                           | dB              | 5.291 dB          |
| 15                | HUB > SAT > MOB               |         | ILE > SAT > HUB |               |                               |                 |                   |
| 16                | UP                            | DOWN    | UP              | DOWN          |                               |                 |                   |
| 17                | FREQUENCY                     | 29900.0 | 2110.0          | 2410.0        | 20100.0                       | MHz             | 1 FREQ ALTERNATE  |
| 18                | SAT REFLECTOR, DIA.           | 1.5     | 20.0            | 20.0          | 2.0                           | m               |                   |
| 19                | ILLUM. FACTOR                 | 0.49    | 0.49            | 0.49          | 0.49                          |                 |                   |
| 20                | 3dB BMW                       | 0.43    | 0.51            | 0.44          | 0.46                          | deg             | CELL MAJ DIAM     |
| 21                | CELL MAJOR DIAM               |         | 0.51            | 0.51          |                               | deg             | 204 sm (E-W)      |
| 22                | MAJOR DIAM XOVER PT           |         | 3.0             | 3.9           |                               | dB              |                   |
| 23                | AVG OFF CTR. LOSS             | 0.2     | 2.0             | 2.6           | 0.2                           | dB              |                   |
| 24                | AVG IN-CELL GAIN              | 50.1    | 47.8            | 48.4          | 49.2                          | dB              | TOTAL US CKTS     |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0     | 2.4             | 1.9           | 0.0                           | PwrFactor       | 30852             |
| 26                | # US BEAMS/ SAT               | 12      | 112             | 112           | 12                            |                 | TOTAL CONUS CKTS  |
| 27                | # CD GRP/BEAM                 | 10      | 1               | 1             | 10                            |                 | 30026 FOR         |
| 28                | # Tx/ CD GRP/ SAT             | 1       | 1               | 275           | 1                             |                 | 1 SATELLITE(S)    |
| 29                | # CIRCUITS/ BEAM              | 2755    | 275             | 1             | 2755                          | CIRCUITS        |                   |
| 30                | RF PWR/ Tx                    | 0.5     | 6.0             | 0.1           | 0.1                           | W               | K-BAND POWER/ SAT |
| 31                | CIRCUIT LOSS                  | -2.7    | -0.8            | -1.0          | -1.0                          | dB              | 12.0 W RF         |
| 32                | ANT RF POWER/ TX              | -5.7    | 7.0             | -11.0         | -11.0                         | dBW             | 34.3 W DC         |
| 33                | TRANSMIT ANT GAIN             | 50.1    | 47.8            | 2.0           | 49.2                          | dB              | TOTAL PWR/ SAT    |
| 34                | EIRP / CDGrp                  | 44.4    | 54.8            | 15.4          | 38.2                          | dBW             | 683 W RF          |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3  | -190.3          | -191.5        | -209.9                        | dB              |                   |
| 36                | Rx FLUX DENS/4kHz             | -154.4  | -144.0          | -183.4        | -160.6                        | dBW/m^2/4kHz    |                   |
| 37                | POLARIZATION LOSS             | -0.5    | -0.5            | -0.5          | -0.5                          | dB              |                   |
| 38                | RECEIVE ANT GAIN              | 50.1    | 2.0             | 48.4          | 49.2                          | dB              |                   |
| 39                | RCVD PWR / CDGrp              | -119.3  | -134.0          | -128.2        | -123.0                        | dBW             |                   |
| 40                | NoFade SIG PWR/ Ckt           | -143.7  | -159.1          | -152.6        | -152.2                        | dBW             |                   |
| 41                | NoFade N+I Terms:             |         |                 |               |                               |                 |                   |
| 42                | SAME CELL                     | -119.3  |                 | -128.2        |                               | dBW             |                   |
| 43                | OTHER CELL SIDELOBES          |         | -132.5          | -128.4        |                               | dBW             |                   |
| 44                | XPOND'D N+I                   |         | -134.0          |               | -123.0                        | dBW             |                   |
| 45                | TOTAL NoFade PATH N+I         | -119.3  | -130.2          | -125.3        | -123.0                        | dBW             |                   |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0     | 4.0             | 1.0           | 0.0                           | dB              |                   |
| 47                | FadeMin NOISE , Nf            | -119.3  | -134.2          | -126.3        | -123.0                        | dBW             |                   |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -143.7  | -163.1          | -153.6        | -152.2                        | dBW             |                   |
| 49                | RCVR NOISE FIGURE             | 4.2     | 3.1             | 2.6           | 4.2                           | dB              |                   |
| 50                | RCVR NOISE (Non-Fade)         | 479.8   | 302.1           | 237.7         | 479.8                         | deg K           |                   |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0   | 270.0           | 290.0         | 80.0                          | deg K           |                   |
| 52                | LOCAL NOISE, NI, in Bspread   | -127.3  | -128.6          | -129.0        | -128.7                        | dBW             |                   |
| 53                | FadeMin TOT NOISE, Nt=Nf+NI   | -118.7  | -127.6          | -124.4        | -122.0                        | dBW             |                   |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3    | -25.6           | 23.7          | 21.7                          |                 |                   |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.6  | -127.6          | -124.4        | -122.0                        | dBW             |                   |
| 56                | S1/P = Signal/Pwr Fraction    | -25.0   |                 | -29.2         |                               | dB              |                   |
| 57                | N/P = Noise/Pwr Fraction      | -0.0    |                 | -0.0          |                               | dB              |                   |
| 58                | VOICE DUTY CYCLE              |         | 0.35            |               | 0.35                          | -               |                   |
| 59                | Eb (FadeMin, Avg On pk)       |         | -195.5          |               | -184.6                        | dBW/Hz          |                   |
| 60                | No, N+I PSD, FadeMin          |         | -200.0          |               | -194.4                        | dBW/Hz          |                   |
| 61                | Eb/No, fade min               |         | 4.5             |               | 9.8                           | dB              |                   |
| 62                | Eb/Nt, req'd                  |         | 4.0             |               | 4.0                           | dB              |                   |
| 63                | MODEM IMP LOSS, M             |         | 0.5             |               | 0.5                           | dB              |                   |
| 64                | EXCESS MARGIN at fade min     |         | 0.0             |               | 5.3                           | dB              |                   |

TABLE E-15

TABLE 1. SATELLITE LINK POWER BUDGET  
FLUX DENSITY LIMITEDTWO SATELLITE CASE  
ALTERNAT FREQUENCY REQUEST

15 MODE

| MSAT POWER BUDGET               | 10 | 01/17/92 | 14:31  | PER SATELLITE EXCEPT AS NOTED |         |                |
|---------------------------------|----|----------|--------|-------------------------------|---------|----------------|
| 7 DC PWR TO S-BAND DOWNLINK     |    | 789      | W      | SPRD BW                       | 15.00   | MH (Sat Total) |
| 8 SAT-MOBL DOWNLINK AMP EFF.    |    | 0.35     |        | BKHL BW                       | 150.0   | MHz            |
| 9 SAT-MOBL RF PWR, TOTAL        |    | 276.1    | W      | FAST FADE                     | 4.0     | dB (One Way)   |
| 10 #US CELLS (inc AK, HI, PR/V) |    | 149      |        | DATA RATE                     | 5000    | bps/ckt        |
| 11 # VOICE CKTS PER CELL (CD GR |    | 185      |        | # SATS.                       | 2       |                |
| 12 # CD GRP/CLUSTER (BKHL MPX)  |    | 10       |        | # US CKTS                     | 27560   |                |
| 13 # CLUSTER PER CONUS          |    | 15       |        | FORD MAR                      | 0.0     |                |
| 14 # 1.25 SUBBANDS/GRP          |    | 12       | 10.0   | RET MARG                      | 4.1     |                |
| 15                              |    |          |        | HUB > SAT > MOB               |         |                |
| 16                              |    |          |        | ILE > SAT > HUB               |         |                |
|                                 |    |          |        | UP                            | DOWN    |                |
| 17 FREQUENCY                    |    | 29900.0  | 2483.5 | 1610.0                        | 20100.0 | MHz            |
| 18 SAT REFLECTOR, DIA.          |    | 1.5      | 20.0   | 20.0                          | 2.0     | m              |
| 19 ILLUM. FACTOR                |    | 0.49     | 0.49   | 0.49                          | 0.49    |                |
| 20 3dB BMW                      |    | 0.43     | 0.43   | 0.67                          | 0.46    | deg            |
| 21 CELL MAJOR DIAM              |    |          | 0.43   | 0.43                          |         | deg            |
| 22 MAJOR DIAM XOVER PT          |    |          | 3.0    | 1.3                           |         | dB             |
| 23 AVG OFF CTR. LOSS            |    | 0.2      | 2.0    | 0.8                           | 0.2     | dB             |
| 24 AVG IN-CELL GAIN             |    | 50.1     | 49.2   | 46.6                          | 49.2    | dB             |
| 25 TOTAL BEAM INTERF FACTOR     |    | 0.0      | 2.4    | 4.3                           | 0.0     | PwrFactor      |
| 26 # US BEAMS/ SAT              |    | 8        | 149    | 149                           | 8       |                |
| 27 # CD GRP/BEAM                |    | 10       | 1      | 1                             | 10      |                |
| 28 # Tx/ CD GRP/ SAT            |    | 1        | 1      | 185                           | 1       |                |
| 29 # CIRCUITS/ BEAM             |    | 1850     | 185    | 1                             | 1850    | CIRCUITS       |
| 30 RF PWR/ Tx                   |    | 0.5      | 3.7    | 0.1                           | 0.1     | W              |
| 31 CIRCUIT LOSS                 |    | -2.7     | -0.8   | -1.0                          | -1.0    | dB             |
| 32 ANT RF POWER/ Tx             |    | -5.7     | 4.9    | -11.0                         | -11.0   | dBW            |
| 33 TRANSMIT ANT GAIN            |    | 50.1     | 49.2   | 2.0                           | 49.2    | dB             |
| 34 EIRP / CDGrp                 |    | 44.4     | 54.1   | 13.7                          | 38.2    | dBW            |
| 35 FREE SPACE PATH LOSS, Lb     |    | -213.3   | -191.7 | -188.0                        | -209.9  | dB             |
| 36 Rx FLUX DENS/4kHz            |    | -153.7   | -144.0 | -184.4                        | -159.9  | dBW/m ^ 2/4KHz |
| 37 POLARIZATION LOSS            |    | -0.5     | -0.5   | -0.5                          | -0.5    | dB             |
| 38 RECEIVE ANT GAIN             |    | 50.1     | 2.0    | 46.6                          | 49.2    | dB             |
| 39 RCVD PWR / CDGrp             |    | -119.3   | -136.1 | -128.2                        | -123.0  | dBW            |
| 40 NoFade SIG PWR/ Ckt          |    | -141.9   | -159.3 | -150.8                        | -152.9  | dBW            |
| 41 NoFade N+I Terms:            |    |          |        |                               |         |                |
| 42 SAME CELL                    |    | -119.3   |        | -128.2                        |         | dBW            |
| 43 OTHER CELL SIDELOBES         |    |          | -134.6 | -123.0                        |         | dBW            |
| 44 XPOND'D N+I                  |    |          | -136.1 |                               | -123.0  | dBW            |
| 45 TOTAL NoFade PATH N+I        |    | -119.3   | -132.3 | -121.8                        | -123.0  | dBW            |
| 46 UNCOMP. FADE ALLOWANCE       |    | 0.0      | 4.0    | 1.0                           | 0.0     | dB             |
| 47 FadeMin NOISE , Nf           |    | -119.3   | -136.3 | -122.8                        | -123.0  | dBW            |
| 48 FadeMin RCVD SIG PWR/Ckt, S1 |    | -141.9   | -163.3 | -151.8                        | -152.9  | dBW            |
| 49 RCVR NOISE FIGURE            |    | 4.2      | 3.1    | 2.6                           | 4.2     | dB             |
| 50 RCVR NOISE (Non-Fade)        |    | 479.8    | 302.1  | 237.7                         | 479.8   | deg K          |
| 51 ANTENNA NOISE (Non-Fade)     |    | 290.0    | 270.0  | 290.0                         | 80.0    | deg K          |
| 52 LOCAL NOISE, NI, in Bspread  |    | -128.0   | -129.3 | -129.6                        | -129.4  | dBW            |
| 53 FadeMin TOT NOISE, Nt=Nf+Ni  |    | -118.7   | -128.5 | -122.0                        | -122.1  | dBW            |
| 54 Rx SYSTEM G/T, pk on ctr     |    | 21.3     | -25.6  | 20.2                          | 21.7    |                |
| 55 FadeMin TOT (S+N+I), P=S1+Nt |    | -118.7   | -128.5 | -122.0                        | -122.1  | dBW            |
| 56 S1 P = Signal/Pwr Fraction   |    | -23.2    |        | -29.8                         |         | dB             |
| 57 NtP = Noise/Pwr Fraction     |    | -0.0     |        | -0.0                          |         | dB             |
| 58 VOICE DUTY CYCLE             |    |          | 0.35   |                               | 0.35    | -              |
| 59 Eb (FadeMin, Avg On pk)      |    |          | -195.8 |                               | -185.3  | dBW/Hz         |
| 60 No. N+I PSD, FadeMin         |    |          | -200.3 |                               | -193.9  | dBW/Hz         |
| 61 Eb No. fade min              |    |          | 4.5    |                               | 8.6     | dB             |
| 62 Eb Nt, req'd                 |    |          | 4.0    |                               | 4.0     | dB             |
| 63 MODEM IMP LOSS, M            |    |          | 0.5    |                               | 0.5     | dB             |
| 64 EXCESS MARGIN at fade min    |    |          | 0.0    |                               | 4.1     | dB             |

TABLE E-16

TABLE 1. SATELLITE LINK POWER BUDGET  
FLUX DENSITY LIMITEDONE SATELLITE CASE  
ALTERNAT FREQUENCY REQUEST

16 MODE

| MSAT POWER BUDGET | 10                            | 01/17/92 | 14:31           | PER SATELLITE EXCEPT AS NOTED |         |                |
|-------------------|-------------------------------|----------|-----------------|-------------------------------|---------|----------------|
| 7                 | DC PWR TO S-BAND DOWNLINK     | 1577     | W               | SPRD BW                       | 15.00   | MH (Sat Total) |
| 8                 | SAT-MOBL DOWNLINK AMP EFF.    | 0.35     |                 | BKHL BW                       | 150.0   | MHz            |
| 9                 | SAT-MOBL RF PWR, TOTAL        | 552.1    | W               | FAST FADE                     | 4.0     | dB (One Way)   |
| 10                | #US CELLS (inc AK, HI, PR/VI) | 149      |                 | DATA RATE                     | 5000    | bps/ckt        |
| 11                | # VOICE CKTS PER CELL (CD GR  | 185      |                 | # SATS.                       | 1       |                |
| 12                | # CD GRP/CLUSTER (BKHL MPX)   | 10       |                 | # US CKTS                     | 27560   |                |
| 13                | # CLUSTER PER CONUS           | 15       |                 | FOR'D MAR                     | 0.0     |                |
| 14                | # 1.25 SUBBANDS/GRP           | 12       | 10.0            | RET MARG                      | 4.1     |                |
| 15                |                               |          | HUB > SAT > MOB | ILE > SAT > HUB               |         |                |
| 16                |                               |          | UP              | DOWN                          | UP      | DOWN           |
| 17                | FREQUENCY                     | 29900.0  | 2483.5          | 1610.0                        | 20100.0 | MHz            |
| 18                | SAT REFLECTOR, DIA.           | 1.5      | 20.0            | 20.0                          | 2.0     | m              |
| 19                | ILLUM. FACTOR                 | 0.49     | 0.49            | 0.49                          | 0.49    |                |
| 20                | 3dB BMW                       | 0.43     | 0.43            | 0.67                          | 0.46    | deg            |
| 21                | CELL MAJOR DIAM               |          | 0.43            | 0.43                          |         | deg            |
| 22                | MAJOR DIAM XOVER PT           |          | 3.0             | 1.3                           |         | dB             |
| 23                | AVG OFF CTR. LOSS             | 0.2      | 2.0             | 0.8                           | 0.2     | dB             |
| 24                | AVG IN-CELL GAIN              | 50.1     | 49.2            | 46.6                          | 49.2    | dB             |
| 25                | TOTAL BEAM INTERF FACTOR      | 0.0      | 2.4             | 4.3                           | 0.0     | PwrFactor      |
| 26                | # US BEAMS/ SAT               | 15       | 149             | 149                           | 15      |                |
| 27                | # CD GRP/BEAM                 | 10       | 1               | 1                             | 10      |                |
| 28                | # Tx/ CD GRP/ SAT             | 1        | 1               | 185                           | 1       |                |
| 29                | # CIRCUITS/ BEAM              | 1850     | 185             | 1                             | 1850    | CIRCUITS       |
| 30                | RF PWR/ Tx                    | 0.5      | 3.7             | 0.1                           | 0.1     | W              |
| 31                | CIRCUIT LOSS                  | -2.7     | -0.8            | -1.0                          | -1.0    | dB             |
| 32                | ANT RF POWER/ Tx              | -5.7     | 4.9             | -11.0                         | -11.0   | dBW            |
| 33                | TRANSMIT ANT GAIN             | 50.1     | 49.2            | 2.0                           | 49.2    | dB             |
| 34                | EIRP / CDGrp                  | 44.4     | 54.1            | 13.7                          | 38.2    | dBW            |
| 35                | FREE SPACE PATH LOSS, Lb      | -213.3   | -191.7          | -188.0                        | -209.9  | dB             |
| 36                | Rx FLUX DENS/4kHz             | -153.7   | -144.0          | -184.4                        | -159.9  | dBW/m ^ 2/4KHz |
| 37                | POLARIZATION LOSS             | -0.5     | -0.5            | -0.5                          | -0.5    | dB             |
| 38                | RECEIVE ANT GAIN              | 50.1     | 2.0             | 46.6                          | 49.2    | dB             |
| 39                | RCVD PWR / CDGrp              | -119.3   | -136.1          | -128.2                        | -123.0  | dBW            |
| 40                | NoFade SIG PWR/ Ckt           | -141.9   | -159.3          | -150.8                        | -152.9  | dBW            |
| 41                | NoFade N+I Terms:             |          |                 |                               |         |                |
| 42                | SAME CELL                     | -119.3   |                 | -128.2                        |         | dBW            |
| 43                | OTHER CELL SIDELOBES          |          | -134.6          | -123.0                        |         | dBW            |
| 44                | XPOND'D N+I                   |          | -136.1          |                               | -123.0  | dBW            |
| 45                | TOTAL NoFade PATH N+I         | -119.3   | -132.3          | -121.8                        | -123.0  | dBW            |
| 46                | UNCOMP. FADE ALLOWANCE        | 0.0      | 4.0             | 1.0                           | 0.0     | dB             |
| 47                | FadeMin NOISE , Nf            | -119.3   | -136.3          | -122.8                        | -123.0  | dBW            |
| 48                | FadeMin RCVD SIG PWR/Ckt, S1  | -141.9   | -163.3          | -151.8                        | -152.9  | dBW            |
| 49                | RCVR NOISE FIGURE             | 4.2      | 3.1             | 2.6                           | 4.2     | dB             |
| 50                | RCVR NOISE (Non-Fade)         | 479.8    | 302.1           | 237.7                         | 479.8   | deg K          |
| 51                | ANTENNA NOISE (Non-Fade)      | 290.0    | 270.0           | 290.0                         | 80.0    | deg K          |
| 52                | LOCAL NOISE, NI, in Bspread   | -128.0   | -129.3          | -129.6                        | -129.4  | dBW            |
| 53                | FadeMin TOT NOISE, Nt=Nf+Ni   | -118.7   | -128.5          | -122.0                        | -122.1  | dBW            |
| 54                | Rx SYSTEM G/T, pk on ctr      | 21.3     | -25.6           | 20.2                          | 21.7    |                |
| 55                | FadeMin TOT (S+N+I), P=S1+Nt  | -118.7   | -128.5          | -122.0                        | -122.1  | dBW            |
| 56                | S1/P = Signal/Pwr Fraction    | -23.2    |                 | -29.8                         |         | dB             |
| 57                | Nt/P = Noise/Pwr Fraction     | -0.0     |                 | -0.0                          |         | dB             |
| 58                | VOICE DUTY CYCLE              |          | 0.35            |                               | 0.35    | -              |
| 59                | Eb (FadeMin, Avg On pk)       |          | -195.8          |                               | -185.3  | dBW/Hz         |
| 60                | No, N+I PSD, FadeMin          |          | -200.3          |                               | -193.9  | dBW/Hz         |
| 61                | Eb/No, fade min               |          | 4.5             |                               | 8.6     | dB             |
| 62                | Eb/Nt, req'd                  |          | 4.0             |                               | 4.0     | dB             |
| 63                | MODEM IMP LOSS, M             |          | 0.5             |                               | 0.5     | dB             |
| 64                | EXCESS MARGIN at fade min     |          | 0.0             |                               | 4.1     | dB             |

TABLE E-17

## 1 CELSAT GROUND PWR BUDGET 01/14/92

|                               |         |          |          |
|-------------------------------|---------|----------|----------|
| 2 CHANNEL BW                  | 2.5 MHz |          |          |
| 3 RANGE                       | 10.0 KM |          |          |
| 4 FOR'D MARG                  | 0.0 dB  |          |          |
| 5 RET MARG                    | 0.1 dB  |          |          |
| 6                             | NODE >M | LE > NOD |          |
| 7 FOR'D                       |         | RETURN   |          |
| 8 FREQUENCY                   | 2110.0  | 2410.0   | MHz      |
| 9 BANDWIDTH                   | 2.5     | 2.5      | MHz      |
| 10 # CIRCUITS/CELL            | 118     | 118      | CIRCUITS |
| 11 TOTAL INTERF FACTOR        | 1.4     | 1.4      | PwrFctr  |
| 12 Io/C1, TOTAL Io, ALL USERS | -41.9   | -41.9    | dB /Hz   |
| 13 POWER AMP (per Tx)         | 20.0    | 0.100    | W , RF   |
| 14 CIRCUIT LOSS               | -0.8    | -1.0     | dB       |
| 15 AVAILABLE RF POWER/BEAM    | 12.2    | -11.0    | dBW      |
| 16 TRANSMIT ANT GAIN          | 4.0     | 1.0      | dB       |
| 17 EIRP (per Beam)            | 16.2    | -10.0    | dBW      |
| 18 VOICE DUTY CYCLE           | 0.35    | 0.35     | Factor   |
| 19 EIRP/CIRCUIT (pk)          | 0.1     | -5.4     | dBW      |
| 20 FREE SPACE LOSS            | -118.9  | -120.1   | dB       |
| 21 ADDL. DIFFRACTION LOSS     | -20.3   | -23.2    | dB       |
| 22 RECEIVE ANT GAIN           | 1.0     | 4.0      | dB *     |
| 23 RCVD PWR/CIRCUIT           | -138.2  | -144.7   | dBW      |
| 24 DATA RATE/CIRCUIT          | 5000.0  | 5000.0   | bps      |
| 25 Eb                         | -175.2  | -181.7   | dBW/Hz   |
| 26 Io (Other Users)           | -180.0  | -186.6   | dBW/Hz   |
| 27 UNCOMP. FADE ALLOWANCE     | 10.0    | 4.0      | dB *     |
| 28 FADED PATH NOISE , If      | -190.0  | -190.6   | dBW/Hz   |
| 29 RCVR NOISE FIGURE          | 3.1     | 2.6      | dB       |
| 30 RCVR NOISE                 | 302.1   | 237.7    | deg K    |
| 31 ANTENNA NOISE              | 270.0   | 290.0    | deg K    |
| 32 LOCAL NOISE, NI            | -201.0  | -201.4   | dBW/Hz   |
| 33 TOTAL NOISE, Nt=If+NI      | -189.7  | -190.3   | dBW/Hz   |
| 34 Eb/Nt, fade min            | 4.5     | 4.6      | dB       |
| 35 Eb/(No+Io), req            | 4.0     | 4.0      | dB       |
| 36 MODEM IMP LOSS, M          | 0.5     | 0.5      | dB       |
| 37 EXCESS MARGIN at fade min  | 0.0     | 0.1      | dB       |

0.0

(2\*1.25 MHz)

.1W is avg at  
major cell radius, 10 km.  
Tx Design provides 15 dB  
addl pwr control.

<This is the Dominant Noise  
and proportional to Tx power

TABLE E-18